MINING CONGRESS JOURNAL

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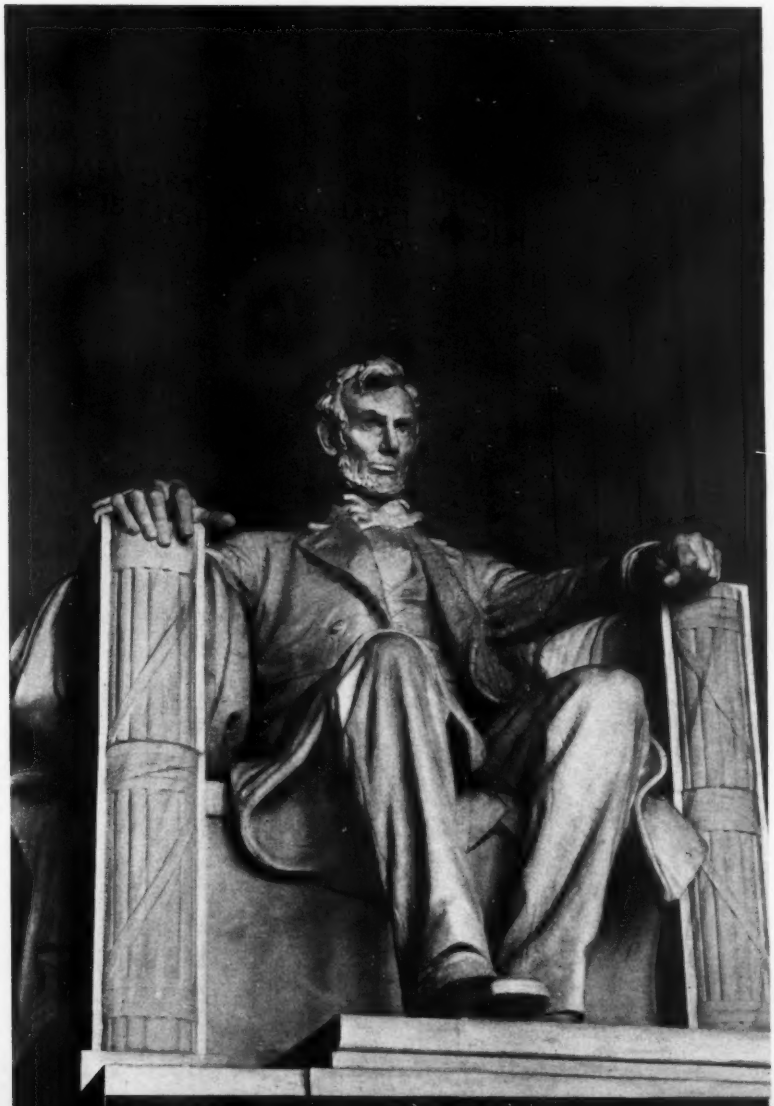

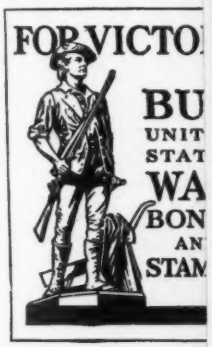

". . . tha
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A JOURNAL for the ENTIRE MINING INDUSTRY

Published by the AMERICAN MINING CONGRESS

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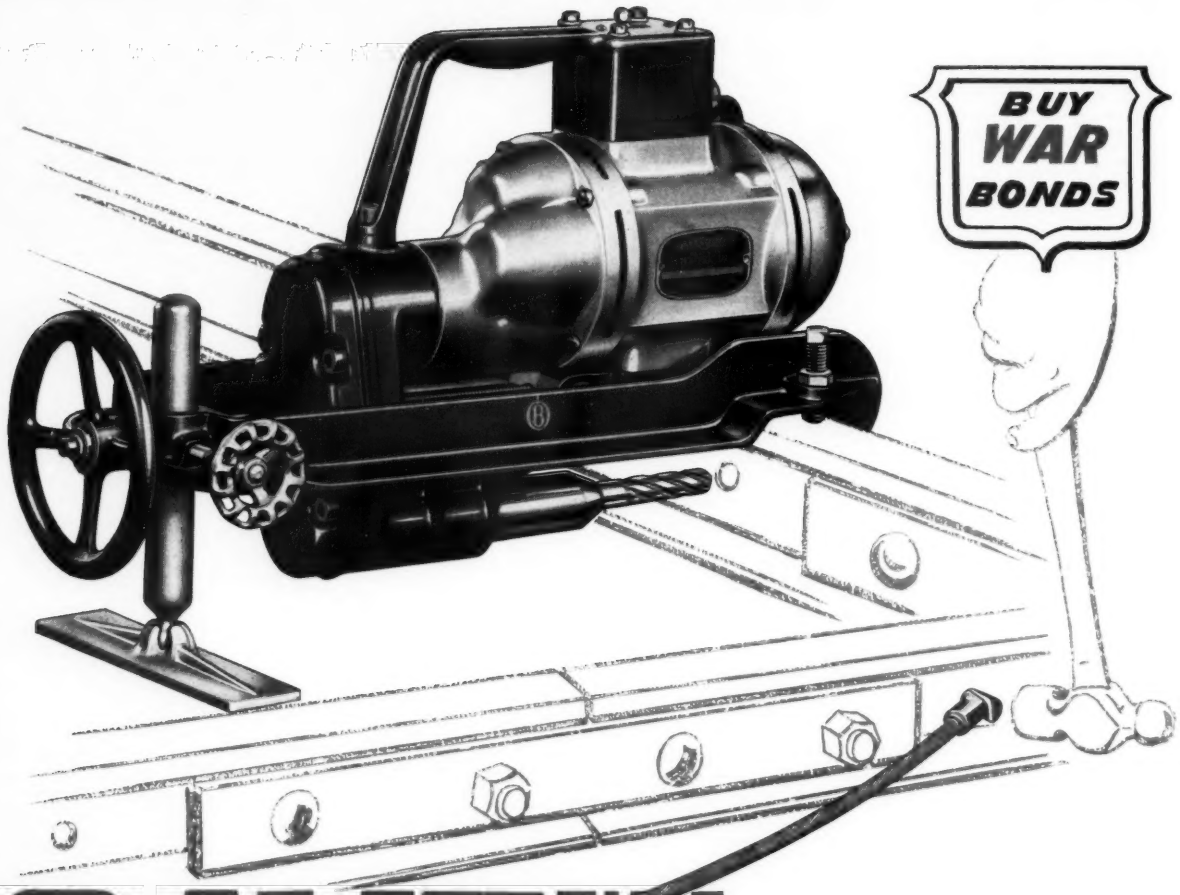

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VOLUME 29, NUMBER 2

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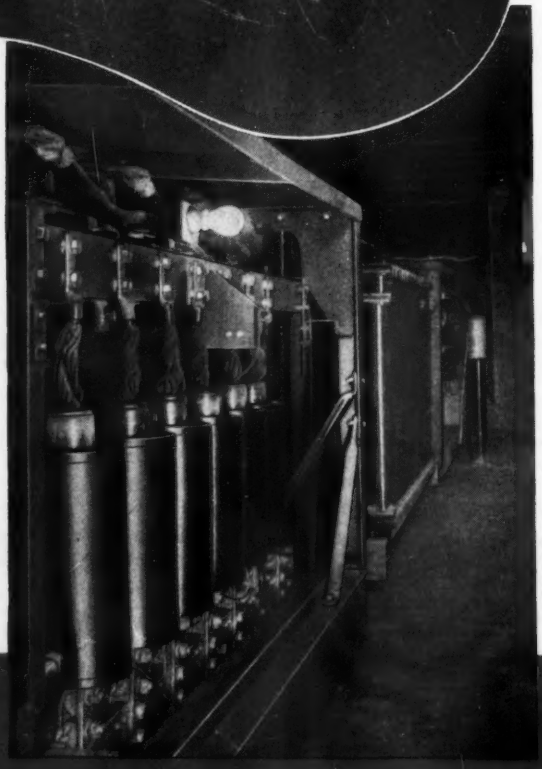
HERE'S UNDERGROUND POWER

In the Big Jim Coal Company mine at Blanche, Ky., this 200-kw G-E portable, d-c substation gives full voltage for most efficient operation equipment at the working face. There's no need for long runs of heavy copper. ↓



→ A close-up of sealed-ignitron units on the rectifier car of a 300-kw portable substation at Union Collieries, Renton, Pa. As a means of underground conversion these factory-sealed, all-metal units make mercury-arc rectification the most practical and the most economically maintained.

TODAY, your decisions concerning underground power depend on a new set of factors: Will a new d-c substation help bring up enough more coal to balance the critical materials that go into it? Will it save enough manpower to balance the installation work? And how soon can it be obtained?

On each of these new counts—as on the old cost-saving, loss-reducing basis—G-E portable substations with sealed-ignitron rectifiers have the odds on their side. Conversion to d-c closer to the working face saves a large amount of copper, an extremely critical material today. It keeps full voltage at the working face. With full voltage at the face you can get greater output from your mechanized equipment, which means you can bring up more coal.

The sealed-ignitron mercury-arc rectifier does the conversion job with less servicing, thus saving manpower. What maintenance there is, is easy. It's a "natural" for mine conditions, where grit and dirt are such a threat to rotating machines.

These G-E portable substations for underground mine service are supplied in ratings from 150 kw to 500 kw; 275 volts to 600 volts, d-c. At the present time we can deliver them to you in less time than it takes to deliver rotating equipment. For complete details and delivery information, call our local office. ***General Electric Company, Schenectady, New York.***

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in step with the times!

G-E Portable D-C Substations . . . with Sealed-ignitron Type Rectifiers

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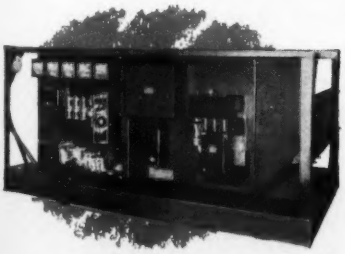
★ **FOR SIMPLER MAINTENANCE** No major rotating parts to care for. The sealed-ignitron units (warranted for 3 years' service) require no pumping. No need for specially trained personnel.

★ **FOR WARTIME CONSERVATION** Saves copper, lowers energy losses in d-c transmission circuits. Requires less critical material than any other type of conversion equipment.

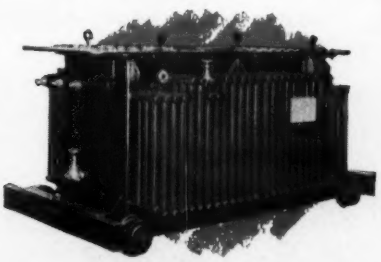
★ **FOR BETTER DELIVERY** At present, delivery schedules on rectifier units are substantially shorter than on rotating equipment. In most cases, over-all costs are lower, too.

JUST "RUN IN" THREE PORTABLE UNITS AND YOUR D-C POWER IS READY

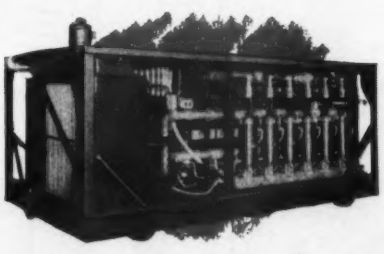
These three integrated "car units" make up a complete substation:



A-c automatic-reclosing switchgear



Pyranol transformer unit



Rectifier car with d-c reclosing switchgear

Builder of ALL TYPES of mine power-conversion units—motor generators, synchronous converters, and rectifiers

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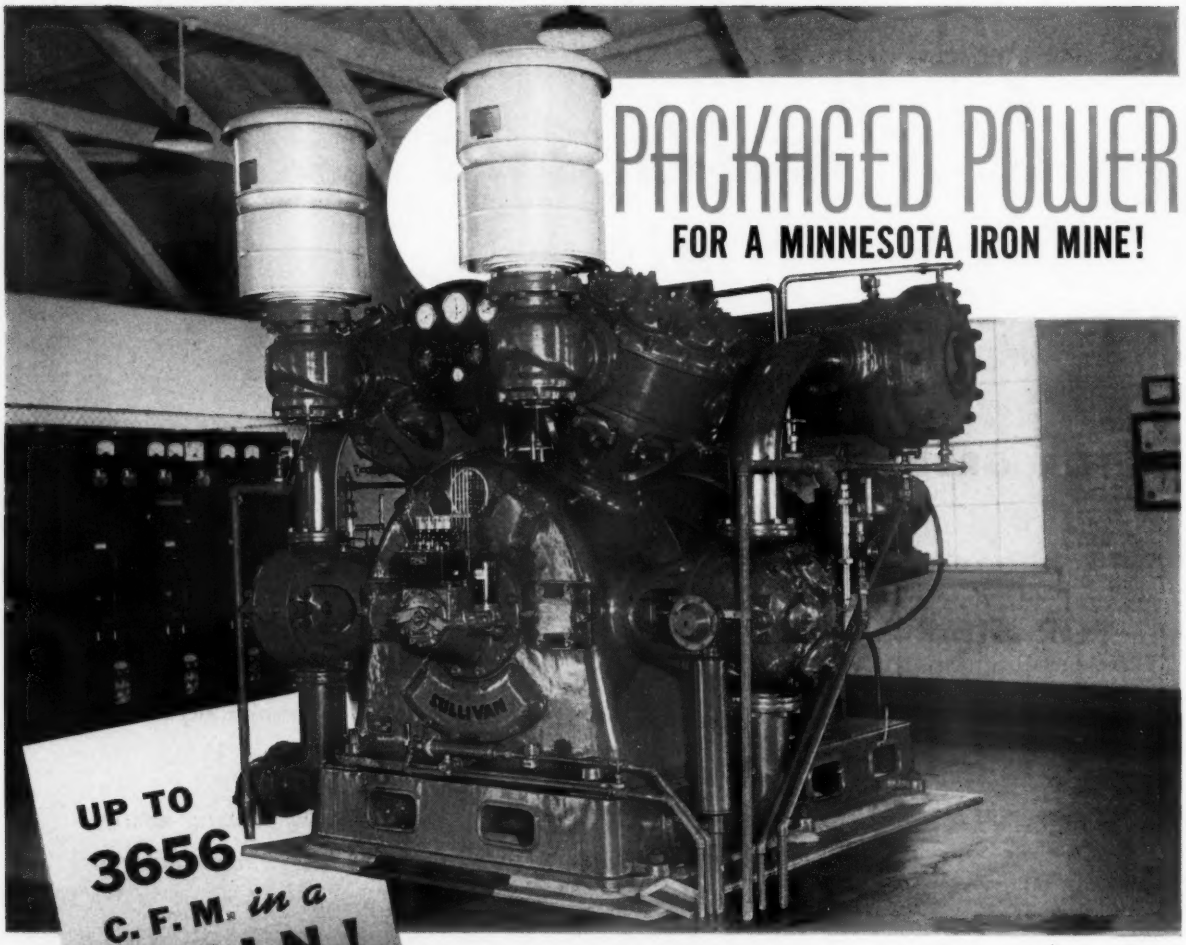

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UP TO 3656 C.F.M. *in a* TWIN!

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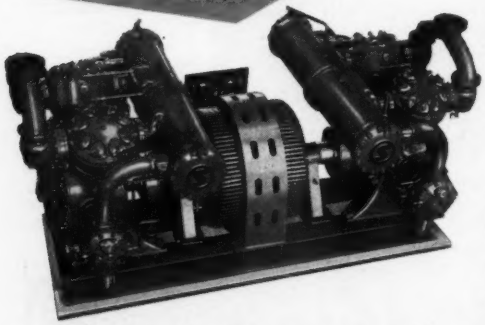
Install it, start it,—then forget it! That's what you can do with Sullivan compressed-air power units, because they are built to give constant, dependable service 24 hours a day, year in and year out.

Sullivan "Package-Type" compressors are two-stage, double-acting, heavy duty, continuous service compressors, much smaller than old style compressors of the same capacity and yet have operating economies equal to, or exceeding, those of older, bulky units of the same capacity.



Sullivan "Package-Type" compressors are available in two and four cylinder models and in single and twin units. Capacities range from 378 c.f.m. to 3656 c.f.m.

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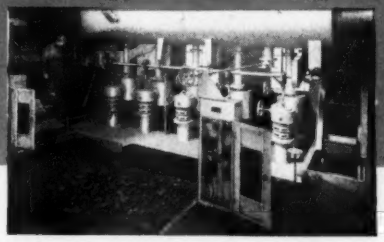

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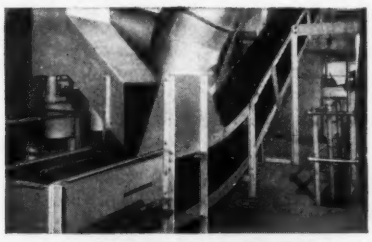
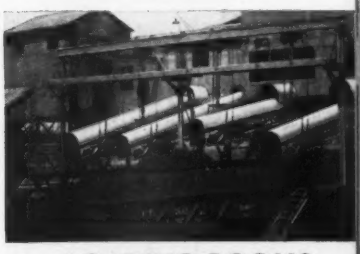
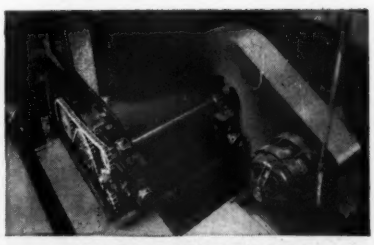


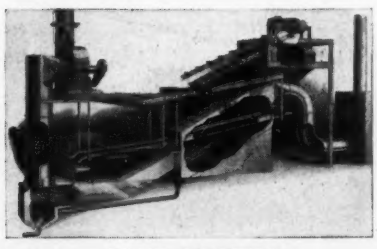
FLIGHT CONVEYORS



LOADING BOOMS



SIZER-CRUSHERS



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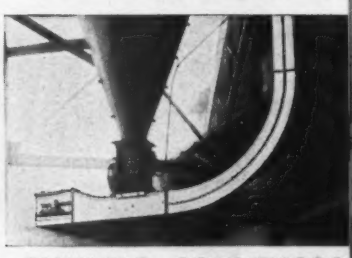
APRON CONVEYORS

BELT CONVEYORS

ROTO-LOUVRE DRYERS



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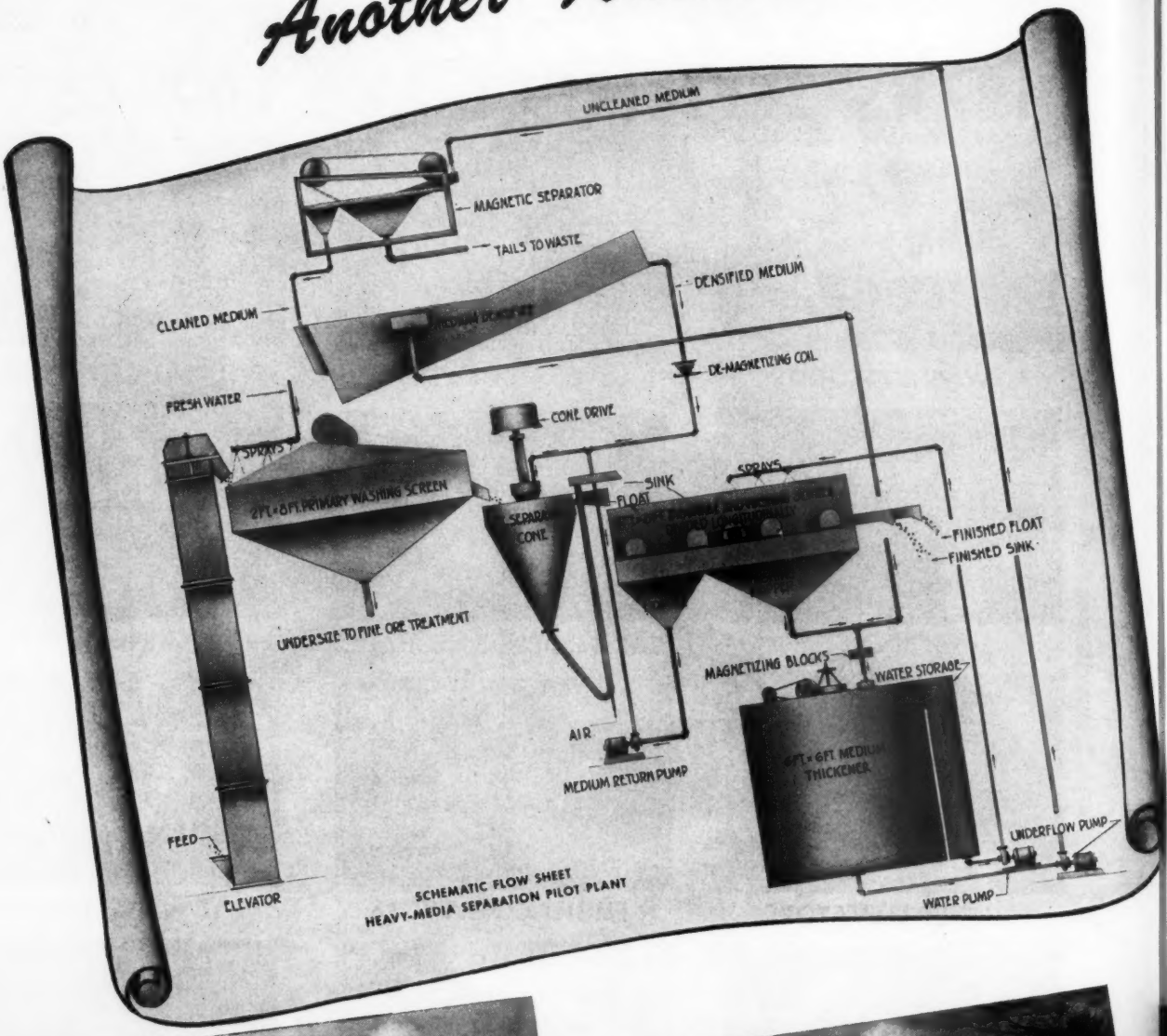


SCHEMATIC FLOW SHEET
HEAVY-MEDIA SEPARATION PILOT PLANT

AMERICAN CYANAMID COMPANY

Cyanamid Ore Dressing Laboratory

New Heavy-Media Separation Pilot Plant Available for Continuous Testing

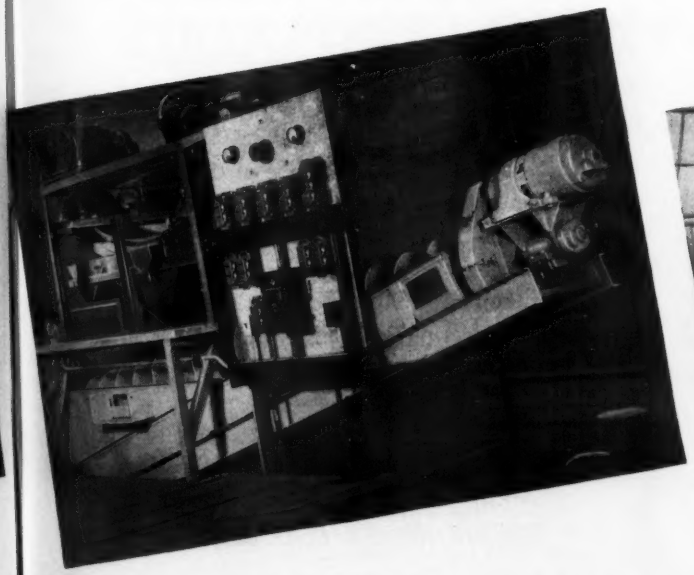
To extend the economic application of Heavy-Media Separation (Sink-Float) by providing an accurate forecast of actual plant results in the treatment of metallic and non-metallic ores, Cyanamid has expanded its Ore Dressing Laboratory facilities to include a continuous pilot plant.

Housed in a specially constructed building, this plant employs the most modern, commercial-size equipment and has a capacity up to five-tons per hour. Thus, continuous testing of large samples can be done under conditions duplicating full-scale operation. While installed primarily to serve the needs of potential users of the Heavy-Media Separation Processes offered by Cyanamid, the plant also increases the scope of our testing facilities on Flotation and gravity separation.

Heavy-Media Separation is now being used to treat large tonnages of Lead-Zinc, Zinc, Tin, Garnet, Cuyuna and Mesabi Iron ores. Test results show its applicability to Magnesite, Fluorspar, Copper, Tungsten, Topaz, Manganese, Sidertic and brown iron ores. Several plants are being designed and constructed.

Using both ferrous and non-ferrous media, Heavy-Media Separation Processes offered by Cyanamid have great scope and flexibility of operation. The increased testing facilities will undoubtedly point the way to even greater economic use of this proven low-cost method for pre-concentrating sub-ores or waste products hitherto considered too low-grade for treatment or for pre-concentrating present mill feed to produce larger metal output from existing equipment; for producing directly a marketable concentrate; or for effecting savings in mining costs.

Expansion of the Cyanamid Ore Dressing Laboratory at this time is in keeping with Cyanamid's long-time policy of providing the mining industry with unexcelled facilities for Chemical, Physical and Microscopical research and testing, as well as facilities for batch and continuous testing to determine the most efficient flow scheme.



30 Rockefeller Plaza, New York, N. Y.

BUT TIMKEN BEARINGS CAN TAKE IT!

Timken Bearing Equipped cars get rough handling at the Princess Dorothy Coal Company, Eunice, W. Va.; not that the cars are deliberately abused, but the nature of the haul is such that some abuse is impossible to avoid.

For example, the trip shown in the photograph has just been lowered down the steep incline in the background at considerable speed. It now is ready to proceed through a mile-long tunnel, thence to the dump and finally down another long and sharp incline.

Sometimes cars get away on the incline and dash violently to the bottom; not a single Timken Bearing has been damaged in this way however. The cars are very large, each carrying 6 tons of coal without difficulty.

The Princess Dorothy Mine is one of the biggest in West Virginia, producing approximately 80 railroad cars of coal per day. The more Timken Bearing Equipped cars you have in your mine, the more coal you can get out. The Timken Roller Bearing Company, Canton, Ohio.

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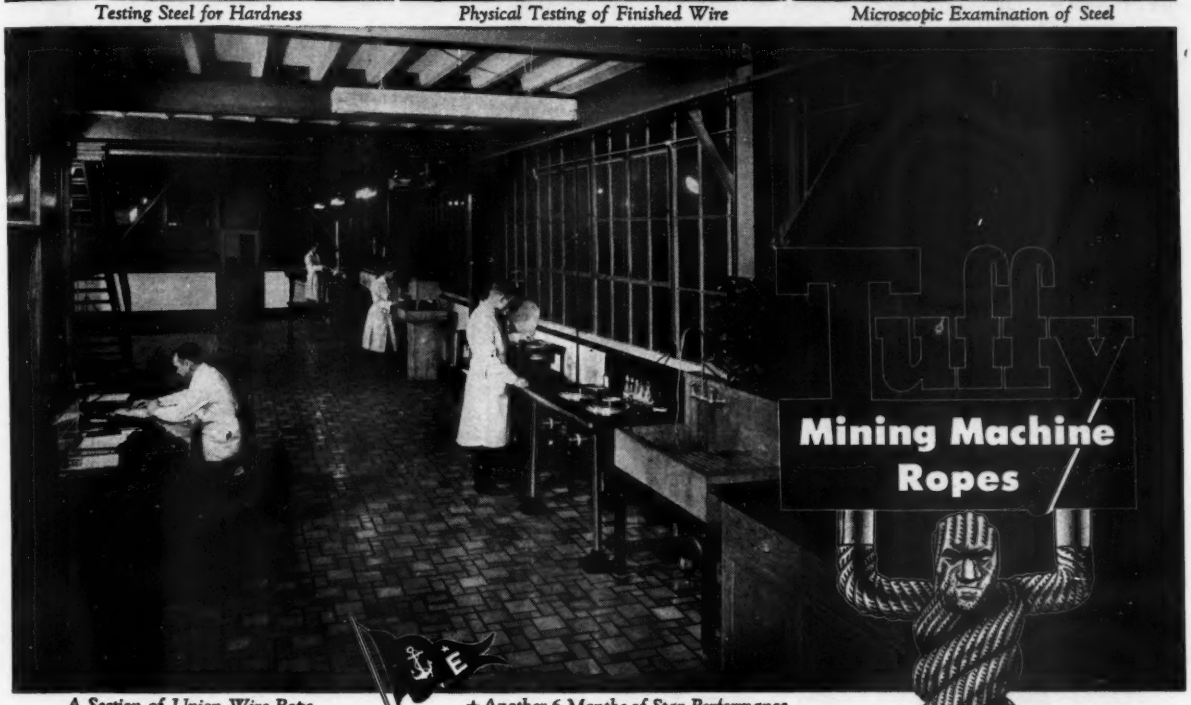
"All There Is In Bearings"

Testing Steel for Hardness

Physical Testing of Finished Wire

Microscopic Examination of Steel



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★Another 6 Months of Star Performance In War Production

Tuffy Can Take It!

BIRTHPLACE OF TOUGHNESS

Out of some 4000 steel formulas, relatively few are suited to wire rope making. From long years of experience, Union Wire Rope engineers and metallurgists have determined upon a steel formula for each type of Union Wire Rope.

To be certain each heat meets specified analysis, steel is examined under a powerful microscopic photo and scanning machine (see photo at top right). In minute detail its micro structure and inherent grain size are analyzed. From this analysis is determined the controlled heat-treatment and the subsequent processing operations it is to be given in the mill to secure wire meeting the exact specifications desired.

Samples of the wire then are brought back into the elaborate Union Wire Rope laboratory. First it is subjected to hardness tests under a delicate pendulum machine (see left photo above) and its Brinell hardness determined. Then in a group of six physical testing machines (see photo at top center) the actual tenisle strength, torsional values, fatigue life, ductility and hardness of wires of all grades and sizes are checked. Here, before the wire is stranded, the ultimate tensile strength, toughness and durability of Union Wire Rope is pre-determined.

Many other research activities are constantly carried on in Union Wire Rope's laboratory. Although not pictured here, there are scientific research machines for testing wire coatings by the salt spray, Preece, strip test and wrap test methods.

Here tough wire is born and on long lines of stranding machines (many of them designed by our own engineers) it grows into Union Wire Rope of maximum strength and greater toughness to withstand harder use and longer service.

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Consulting service at Southwestern is as complete or as limited as desired. In some cases, after Southwestern has designed and built a milling plant, actual operation is supervised by our experienced engineers on a consulting basis.

ANY one or all four Southwestern services available to mine operators are geared to mesh perfectly in accomplishing results. There is no guesswork. In designing and building a mill, every step from preliminary survey to completion and operation, is planned. When Southwestern is entrusted with the job, responsibility for satisfaction rests with a single organization . . . with one bill to pay. Write for Bulletin 402.

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- Low over-all height of machine makes it suitable for low or high coal.
- Electrical construction may be Permissible or Standard.

For details of this all-purpose machine see a Goodman sales engineer or write for Bulletin M-421

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PHOTOGRAPH PASSED BY CENSOR—COURTESY OF TELENEWS NEWSREEL THEATRES

WANTED: CRITICAL MINERALS

What are they? Here is latest grouping of many critical minerals: (1) Chromium, cobalt, copper, copper scrap, magnesium, nickel, nickel scrap, tin, tungsten, zinc, corundum, graphite, and mica; (2) Antimony, lead, lithium, manganese, molybdenum, bismuth, phosphate, potash, bauxite, fluorspar, magnesite, rutil, and zircon; (3) Silver, coal, feldspar, silica sand, sulphur, and vermiculite.

Increased production of these critical minerals is essential and the entire output of Denver Equipment Company has been devoted to manufacturing machines to speed recovery of these minerals. Such a plant is the one above . . . 400 Denver "Sub-A" Type Flotation Cells in this mill, operating "24 hours per day," produce a critical mineral in a United Nation country that turned back the Axis.

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AMERICAN explosives and blasting supplies are fitted for this task. They are products of intensive research, proper chemical control and thorough inspection in the course of manufacture. Capable technical service men are available to assist you with your blasting problems.

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EXTRA

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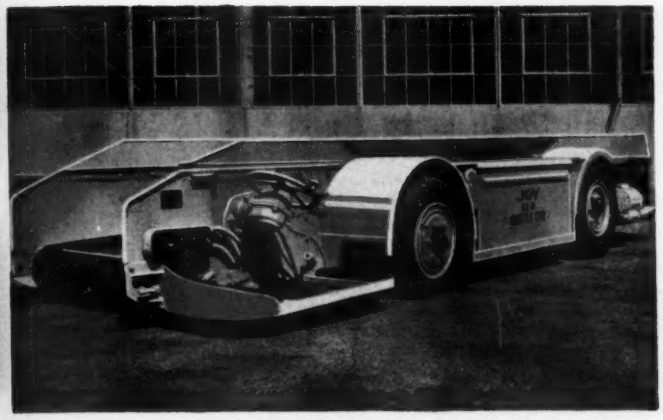
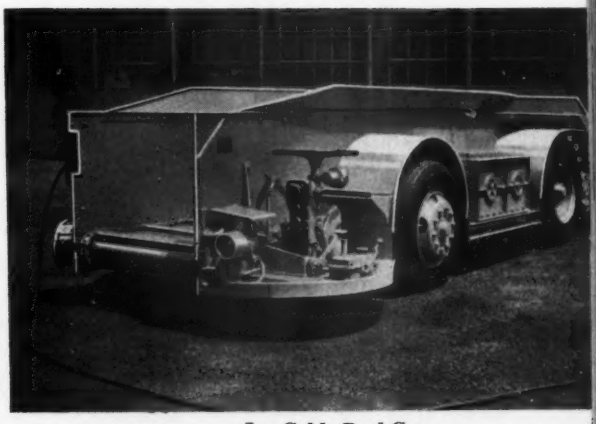
★★★ TO PRODUCE

HELP



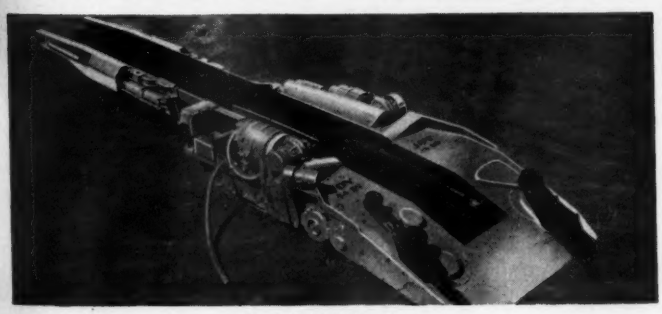
Joy low vein Shuttle Car



Joy Cable Reel Car

Joy 11-BU Loader and four-wheel drive Shuttle Car

"This Joy Equipment is certainly moving up Production Fi



Joy 14-BU Loader

MORE COAL

JOY
MANUFACTURING
FRANKLIN, PA.

SANFORD-DAY

—a name to remember in 1943

★ **Are you prepared to meet the production requirements of coal mining this year? Every indication points to demands never before shouldered by the coal mining industry.**

Today, old, obsolete mine cars—obsolete in type, aged—are, in hundreds of mines, directly responsible for tremendous losses in tonnage—so called bottlenecks that not only retard production but prevent a superintendent from getting maximum results from available man power.

We know of mining officials who haven't the slightest conception of the amazing recent improvements that Sanford-Day has made in mine cars. Advertising pages simply cannot tell the story. You have to see S-D "Automatics" in operation—in the mine—to fully realize what a big advantage an S-D "Automatic" mine has over mines with other types of cars. Advantages in greater production with fewer cars; advantages in less man power, in less maintenance and in more profitable operation.

Only a very few mining men have had an opportunity to see our new S-D "NOCKOUT AUTOMATIC" car. The car with our new "Nockout" door releasing mechanism—the most valuable improvement made in mine cars since we developed the 1-2-3 door operating arrangement. Customary lever bar and all associated parts on outside of car have been eliminated entirely. Latch mechanism is completely protected . . . out of the way . . . out of trouble. Labor at dumping bin is useless because operation is all automatic, safe and foolproof.

SANFORD-DAY is a name to remember this year, and don't forget it. Let it be a reminder that to increase production—to do it with fewer cars and with less man power, it will pay you handsomely to investigate S-D "Automatic" perfect operation.

Remember, you can RENT "Automatics" on a basis so liberal that your savings will far exceed your rentals. You should inform yourself about S-D "Automatics" NOW.

THIS IS THE NEW S-D "NOCKOUT AUTOMATIC." Since there are no lever bars to be tripped accidentally, the doors of the new S-D "Nockout Automatic" will never fall until the two separately operated latch hooks, which give a double safety feature, are automatically disengaged by the nockout device at the dumping bin.

Sanford-Day Iron Works, KNOXVILLE, TENNESSEE

BUY WAR BONDS AND STAMPS

Every Time The Clock Ticks . . .
Hundreds of MARIONS Swing Into Action

Fighting fronts are geared to the home front where hundreds of MARIONS make every second count, digging and handling thousands of tons of critical raw materials for our mighty war machine. When the first shot was fired, MARIONS accepted this production challenge and have been on the offensive ever since. It is upon such dependable performance and tireless effort that second fronts and Victory are built.

THE MARION STEAM SHOVEL COMPANY, Marion, O., U. S. A.

MARION

SHOVELS · DRAGLINES · CLAMSHE

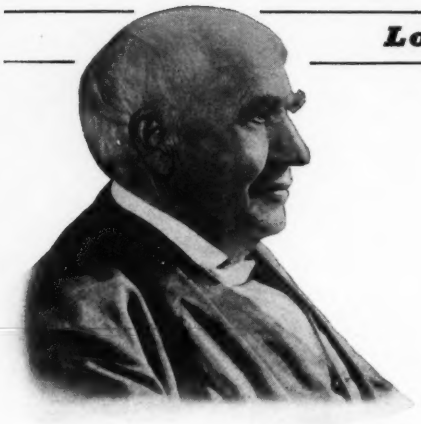
CRANES · PORTAL CRANES · WALK

WORKING FOR VICTORY: DIGGING — Coal • Magnesium
Iron Ore • Copper Ore • Bauxite • Manganese • Nick
Molybdenum • Sand & Gravel • Clay

MATERIAL HANDLING — Shipbuilding and Cargo Loadi

BUILDING — Airports, Ordnance Plants, Arsenals, Arm
Camps, Marine Bases, etc.

Long the Leader . . . Ever a Pioneer



. . . . Mister Edison was having trouble

IT WAS back in 1891. Thomas A. Edison had invented a magnetic separator for the concentration of low grade iron ore. He had also created new processes for crushing and briquetting the ore. Now, all he had to do was start production.

But he ran into unexpected difficulties. Not with the separator, or the crusher, or the briquetter. His problem concerned something extraneous . . . but essential. He had conveyor trouble. He had expected to use the only types of conveyors then current: scraper and gravity bucket. Neither of these had ever been called upon to handle abrasive materials (which had always been moved in cars) or to attain the required speed (200 TPH). They failed completely.

Mr. Edison next tried a daring experiment. He used a *belt* conveyor. Up to then, belt conveyors had been restricted to carrying grain. They were thin, had no special cover, and were run flat on wooden idlers. Naturally, they wore out quickly. Another experiment seemed doomed to failure.

The First Belt Made Especially for Conveying Materials

ABOUT that time, a man named Thomas Robins called on Mr. Edison. Being a salesman for a rubber company—and, himself, a pioneering spirit—he was interested in this attempted new use for a rubber product.

After looking over the plant and analyzing the handling problem, Mr. Robins believed that a conveyor belt could be created specifically for the purpose.

In fact, Mr. Robins astonished the great inventor and his colleagues by stating that a piece of rubber, when exposed to the heavy falling stream of crushed ore, would outlast many times its own thickness of the hardest steel. What was more, he could prove it.

Then Mr. Robins ran into difficulties. The company he represented would have nothing to do with such a "crack-brained" idea. But he persisted and finally found a concern willing to produce a belt to specifications. Thus was created the first belt made especially for conveying materials.

From that humble beginning and single idea has grown the present firm of ROBINS . . . long the leader, ever a pioneer in modern materials handling machinery. Submit *your* problems to ROBINS.

ROBINS
CONVEYING BELT COMPANY
PASSAIC, N. J.

For Material Aid in Materials Handling . . . It's ROBINS

MINING
CONGRESS JOURNAL
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A War Minerals Director

THE announcement on January 30 of the appointment of Howard I. Young to a key post in mining matters for all of the war agencies struck a note of confidence and hope throughout the mining industry. Confidence because Mr. Young's abilities are well known, and hope that he can bring about a more thorough understanding in government of the problems and realities of mining. Mr. Young has had many years of experience in the operating and administrative branches of the industry. His ability, integrity and straightforward sincerity and capacity for work have withstood the test of time in a career which has enjoyed wide public relations among mine operators, workers and top executives.

War Production Board Chairman Donald M. Nelson has emphasized that the war program must be assured of sufficient supplies of minerals and metals. In announcing Mr. Young's appointment, he stated that handling of this problem has been widely divided among governmental agencies, and that eleven such agencies will now coordinate and concentrate their programs into a single plan. He said: "To aid Mr. Young in reaching decisions concerning the development of resources two new groups have been established. The larger, called the Minerals and Metals Advisory Committee, comprises representatives of all the major governmental agencies concerned with the production of ore. These include: War Department; Navy Department; Board of Economic Warfare; Reconstruction Finance Corporation; Bureau of Mines; Geological Survey; Bureau of Foreign and Domestic Commerce; Office of Civilian Supply, WPB; Office of Production Research and Development, WPB; Facilities Bureau, WPB; Labor Production Division, WPB, and Stockpiling and Transportation Division, WPB.

"The smaller group, called the Mineral Resources Operating Committee, will be composed of a representative to be named by the Secretary of the Interior and representatives of the Board of Economic Warfare, the Reconstruction Finance Corporation and the Office of Production Research and Development, WPB, in addition to Chairman Young. At meetings of the two committees, all proposals and programs can be thoroughly discussed. The broad, general picture of such plans will be presented by the Advisory Committee and more specific working programs will be considered by the Operating Committee.

"In this way proposals for investigating and exploring ore bodies and for testing, developing and utilizing new processes for production of minerals and metals will represent the combined efforts of all groups to increase raw material supply. Only those proposals and programs reviewed and recommended by the Operating Committee will be considered for final approval."

Under the new arrangement, the Mineral Resources Coordinating Division will be responsible for coordinating plans, programs and procedures within WPB and with other governmental agencies. It also will assemble recommendations for increasing the minerals supply.

The War Production Board has asked another able man to undertake a tough job. Large net gain for the war program lies ahead and will be achieved only through diligent and sincere teamwork among the war agencies and branches of government working with Mr. Young. Likewise, Mr. Young can convey with confidence and understanding the policies and needs of the war program to the industry.

Avoid That Bottleneck

BACK in 1940 when the war began to spread in Europe, mine executives viewed the situation with apprehension, because they knew only too well the historic trends and experiences which developed for the industry in the last war. They knew how important it was to have stock rooms and warehouses well supplied with mining tools—just in case. In 1940-1941 mine equipment manufacturers supplied these needs, and as 1942 approached most mine operators found themselves in a comfortable position with respect to spare parts, materials and equipment.

On December 7, 1941, it happened! We were plunged into war overnight. The demands of our program grew in leaps and bounds and increasing production was the every-day order during 1942. Priorities on equipment for the mining industry became tighter, but materials did come through. Those well supplied stock rooms at the mines throughout the country assumed a roomier aspect, as the reserves of spare parts, tools, equipment and supplies were used up in 1942 for the record making production achievements.

As the second year of war now gains momentum, mine operators are fully aware that a 24-hour per day job must be maintained. They also realize that the exigencies of war have further tightened the supply of all critical materials used in mining equipment. In spite of high ratings provided by the Mining Equipment Division, deliveries of vital equipment have been held up by limitation orders and directives from "somewhere on top." Granted that continuance of this procedure, in the future, may not be as great when the Control Materials Plan unfolds, it still can create bottlenecks in the intensified flow of metals and minerals for total war. The record so far shows that more than a few copper fabricating plants have been forced to suspend operations because of a metal shortage.

When the big shooting starts on the 2nd, 3rd and more far-flung battle fronts, the consumption and need of shells and war equipment will reach in-

credible proportions. The metals for these shells and military equipment are being mined now, and any diverting of mining equipment "somewhere on top" is merely eliminating one bottleneck and creating several, of more acute character, in the basic mining industry. The equipment needs of the industry at this particular time are vital, and they are not great when compared to requirements of building ships, tanks and airplanes. The industry views the trend with apprehension. It asks that strength be given to the arm of the Mining Equipment Division in cutting through the red tape of "limitation" orders, and *all* matters of materials for the mines and for the manufacture of mining machinery be channeled through that Division, with power to act.

There's a Lot of Work and Fighting to be Done

FORTUNATE though we are to be the largest industrial nation in the world, we have been forced to strip our gears of peaceful life once again after 25 years, and to make our existence, as well as that of millions of other freedom-loving people, depend upon building a super war-machine within the short period of a year. This has virtually been done.

As a result we now have a greater sense of security from our enemies. Pride fills every American heart as he reviews the splendid job our boys have done so far on the fighting fronts, and the incredible production records achieved by American labor and industry. The American way of free enterprise has etched itself deeper into a smaller, but more enlightened world, and has demonstrated its ability and strength in a global cataclysm for the second time in a generation. There is little doubt but that people in all the United Nations as well as in the Axis and occupied countries have marveled at our capacity to unite, work and demonstrate the supreme test of our democratic way of life.

Our 1942 record is good to look at, but we also regret the millions of words, dollars and manpower hours we wasted, and that thousands of lives had to be lost in battle. In 1942 we started down the road of depleting our natural resources, on a scale never before equaled, and we cannot plan otherwise until victory is definite. The realities of the darker side must not be overlooked in any valedictory to our first year in World War II.

Our coal, metal and non-metallic mining industries are supplying raw materials for a world-shaking war machine. The American mining industry has a stake in this conflict far exceeding that of World War I. Its responsibilities are commensurately greater as the war progresses. Achievements made so far by the coal and metal miner cannot be expressed in accurate tonnages; only a hint can be given in the pages which follow in this issue. From these, however, will be learned that hard, tiresome work and effort by mine operators and manufacturers welded to labor, government and war agencies made new production records possible. Years of research and study in mining methods, geology, coal preparation, ore dressing and metallurgy, and cooperation between mine operators and manufacturers are crystallized as outstanding contributions to the war program by the entire industry in 1942. Every pound of coal and copper, zinc, iron ore and all the other critical and strategic materials which the industry gave our fighting men pushed the enemy closer to the abyss of defeat.

Our war production has been under way now for more than a year, whereas large-scale fighting is yet to come. The mining industry views 1943 as a year when problems will not diminish but increase. By July 1 nearly 70 per cent of our total national income will be devoted to war. The end of 1943 will bring a clearer understanding of what blood, sweat and tears in total war really means. The mining industry is not guessing as to when the war may end, and there is but one objective—maximum production every day in 1943 and until unconditional surrender is a fact. This will not be easy.

The problems involving manpower, supplies and equipment, operating costs, price ceilings, premium prices, plans for greater production, safety first, scrap salvage, maintenance, conservation, labor contracts, taxation and thoughts of post-war problems are but a few of the responsibilities that lie ahead with increasing weight for the coal, metal and non-metallic mining industries. It all boils down to acquiring toughness against attrition. Yes, there's a lot of work and fighting to be done.

When peace comes, and the tremendous war machine slows down, the realities of international and national, political, social, economic, moral and other problems will descend upon this generation and burden the next. Free enterprise, the creator of world industry, will find itself in a badly dislocated economy, but war-weary people of all nations will yearn for freedom of speech, of religion, and freedom from want and fear, all of which must give mankind the right to live in an atmosphere of democratic individualism.

This will be done.

Copper Mines Achieving New Goals

Producers in the Arsenal of Democracy made new records in 1942, but the war demands for this metal remain unsatisfied. Labor needed to bring facilities up to capacity.

TOTAL UNITED STATES copper supply, which reached an all-time high of about 2,460,000 tons in 1941, was increased to nearly 3,000,000 tons in 1942. Despite a 1942 supply available to our country greater than the entire known world output in 1939, and despite the shutting off of all copper to non-essential needs, production in many munitions plants was dislocated because copper was not available.

To encourage production of lower grade ores, the WPB, OPA and Metals Reserve Company announced a premium payment plan early in 1942 to pay 5 cents a pound above the regular 12 cents for all production over certain quotas. The largest producers, however, did not benefit materially this plan. Scrap collection was a most important source of metal, resulting in more than 600,000 tons of refined copper in 1942.

The most important problem in maintaining copper production during 1942 was a shortage of labor. This became acute in the middle of the year, and more than 5,000 tons of copper a month were lost in July and August because of the manpower shortage. In spite of a wage increase amounting to about one dollar a day, competition from ship yards, aircraft plants, army construction, and other projects constantly attracted men from the mines. It was virtually impossible to increase the labor supply in many mines and extremely difficult to maintain even normal employment in many operations. About 4,000 soldiers with mining experience were furloughed in October to work in the mines, most of whom went to the copper properties. Operators have paid many compliments to soldier-miners for the splendid work they are doing.

The industry is hoping that action by the War Manpower Commission will increase the supply of common labor to replace upgraded men. Observers believe existing facilities at the copper mines would be brought to maximum capacity soon after this was accomplished.

The tightness of the copper situation is demonstrated by the fact that copper currently used for domestic electric systems, communications, industrial motors and fittings, chemical plants and all of the thousands of industrial and essential civilian purposes which must be met is much less than one-fifth of our total supply. Copper scarcity is further reflected by the announcement of the Copper Branch that even brass and wire mills and foundries would be allotted no copper of any kind, including scrap, except on preference ratings of A-1-a and higher.

In the face of this unprecedented demand for copper to feed the war machine, domestic production in 1942 was more than twice 1938 production, and imports are greater than ever before.

Production is being increased by intensified effort in the present operating mines, and by bringing into production the sub-marginal mines whose operation in peace-time had not been economic. Large producers (15 mines produce 98½ percent of our copper; 270 mines the remainder) are operating at capacity as far as the labor supply allows. Some mines are working 168 hours a week.

The nation's largest single producer, Utah Copper Company, supplied around 26,000 tons of refined copper a month. The new Morenci open pit operation in Arizona of the Phelps-Dodge Corporation started production in January, 1942, and provided a very substantial supply of metal throughout the year. Even higher output is expected from this operation in 1943. Other open pit and underground mines in the United States, as well as in Mexico and South America added to their equipment and increased production in 1942. Some of these foreign properties may show even greater output in 1943.

Refining and smelting facilities are already taxed heavily. To overcome this bottleneck, foundries now are accomplishing the extremely difficult operation of converting scrap into black copper. This permits maximum output of facilities of all types, and by using foundry furnaces increases the over-all supply of usable copper. This is an unusual operation and it places heavy burdens on the foundries. Yet it is another case of industry, in cooperation with WPB, doing the virtually impossible to increase our supply of critical materials.

Imports constitute an important part of our copper supply with Chile, Peru and Mexico, Africa and Canada all aiding in satisfying the war needs of the United Nations.

Copper from 40,000 tons of ore begins its journey to the battle fronts

Zinc In 1942

The Premium Price Plan aided production, and some increase in metal output is expected in 1943. The volume of known zinc ore reserves pose a problem which obscures the future of the domestic industry.

By ERNEST V. GENT

Secretary, American Zinc Institute, Inc.

IN 1942, production continued to be the keynote of the zinc industry. In line with earlier plans, refining and smelting facilities were expanded still further during the year; but, because of priority and manpower problems, the scheduled peak production was somewhat delayed and will not be reached until the second quarter of 1943. Although total output for the year was well ahead of 1941, the annual rate of production in December, which was expected to break all records, more clearly reflects the progress made toward the objectives of the smelter program.

Mine Production and the Premium Price Plan

Domestic mine production in 1942 will not be so very far off past performance and sufficient imports, which are growing in significance, will have been found available to make up the difference required to operate smelters and refineries at maximum capacity. Estimates for 1943 are based upon much the same calculations—all predicated upon the belief that the economic needs will be recognized by Washington and that the necessary bases will be provided to maintain, if not increase, present activities at domestic mines. This is essential if results are to be obtained and there is to be time to wrestle with manpower and other production problems.

In an effort to increase domestic mine production, a premium plan for over-quota production of zinc after February 1, 1942, was announced early in the year. The premium price was fixed on the basis of 11c E. St. Louis for slab zinc as against the regular price of 8.25c. In the Tri-State District, the difference was declared the equivalent of an extra $28.05 a ton for 60 percent concentrates to be paid to the miner by Metals Reserve Company. Late in the year this figure was adjusted to $29.70. (See page 91.)

Horizontal retorts in a zinc smelting plant

Obviously, the success of such a plan depends largely upon the quota limits set. As each operation is treated separately on its own merits, a great deal of time was needed to determine initial quotas. Because of changing conditions related to both costs and grades, it has been found necessary to review and revise quotas from time to time in an effort to maintain output. While some disappointment has been expressed in the failure of the premium price plan to increase previous mine production, it must not be overlooked that, under all the circumstances, the maintenance of past production is a considerable achievement.

In the view of some competent authorities, the current situation now calls for the liberalization and expansion of the premium price limits. If ore is to be mined at home in keeping with the needs of the enlarged smelting capacity, it appears obvious that the steadily falling grade of ore available must be utilized regardless of the increasing cost of mining and milling such ore. This applies particularly to the situation in the Tri-State District.

Beyond 1943, the mine production outlook is not particularly cheerful; but much will depend upon the approach to the immediate difficulties, which, if taken in hand promptly and dealt with in sound fashion, should shape the future along more effective lines. If the immediate problems are not solved, 1943 domestic ore estimates will need to be discounted and the outlook beyond will seriously deteriorate.

As to the price of the metal, there was no change in 1942 insofar as the

producer and the consumer were concerned. The ceiling of 8.25c E. St. Louis, fixed by Washington on October 10, 1941, maintained throughout the year.

High Grade Metal Output Increases

Another important development in connection with production was the increase during 1942 in High Grade metal output, including not only substantial additions to existing plants, but the starting of a new one. Furthermore, to supplement the High Grade tonnage, redistillation capacity was greatly increased and will again be largely increased by the time peak production is reached in 1943. This gives extraordinary flexibility in dealing with the demand for grades but does not add to the over-all supply, the redistillation process depending as it does upon the lower grades for feed metal, which is converted into High Grade zinc.

There are rather strong indications that it is becoming more generally recognized that the zinc smelting capacity already scheduled is sufficient, or at least it will have to do. In future there is likely to be more emphasis upon mine production, where it belongs, for this may well prove to be the limiting factor.

Government Increases Controls

The year 1942 saw increasing control of zinc and its products by Washington. General Preference Order M-11, which became effective on July 1, 1941, with its amendments, continued through May 31, 1942. This order placed deliveries of the entire production of slab zinc under the control of the Office of Production Management.

While the Director of Priorities exercised this right with respect to a part of the output, the balance of the tonnage continued to be distributed by the industry until June 1, 1942, when Order M-11, as amended May 1, 1942, became effective. This prohibited deliveries except upon presentation of an allocation certificate issued by the Director of Industry Operations. Thus the entire production of slab zinc was channeled through the hands of the War Production Board commencing June 1 and through the balance of 1942.

Conservation Order M-11-b, issued under date of July 24, 1942, was the first direct approach to the prohibition and restriction of the use of zinc. Except for U. S. Government and Lend-Lease account and certain other special exceptions, the use of zinc in the production of stipulated items which appeared on List A was cut in half to September first and thereafter entirely prohibited. The use of zinc in items not included in the list was reduced by 25 percent in the case of Prime Western zinc and 50 percent in the case of other grades.

A flotation section in a mill recovering zinc concentrates

An early amendment prohibited the use of zinc after October 10, 1942, to make closures for glass containers, one of the important uses of rolled zinc in normal times, which started a new list of items known as A-1. The most recent amendment of Conservation Order M-11-b, dated November 26, 1942, makes minor changes in List A and adds to the prohibited items on List A-1. Restriction on the production of dry cell batteries were imposed by General Limitation Order L-71 as amended October 2, 1942, while Amendment No. 1 to General Conservation Order M-99 restricts the use of zinc plates used in printing.

Late in the year it was announced that zinc dust would come under complete allocation and use control by the War Production Board commencing January 1, 1943, by General Preference Order M-11-1, issued on December 22. Order M-11-a was amended to eliminate zinc dust and to cover zinc oxide alone. This order continues to provide that each producer shall set aside from his monthly production the quantity of zinc oxide called for by the Director of Industry Operations for allocation by him. No such call has been made since May, 1942, and the industry has dealt with the demands currently without difficulty. French process oxide, produced directly from metal, has for some time been practically reduced to the bare necessities, including U. S. P. requirements. The 1943 requirements for zinc oxide will greatly depend upon the rubber program, as well as upon the demands for zinc oxide pigments for paint and other wartime necessities. At the moment, ample capacity exists to take care of any reasonable increase in the zinc oxide needs which may develop.

Brass Making Takes Large Volume of Zinc

Naturally, as the war program progresses, use patterns change. For example, according to published reports, galvanizing operations late in the year were found to be only about 40 percent of what they were a year earlier. It is reasonable to assume that, with the severe restrictions on both steel and zinc, galvanizing now is largely for war uses and the tonnage of zinc so used may be near the irreducible minimum.

As everyone knows, brass mill capacity has continued to expand, which calls for increasing quantities of zinc. Brass now takes first, instead of second, place as the largest outlet for zinc.

Exports continue to be significant. According to a recent statement attributed to the President, Lend-Lease and direct purchases of zinc by our Allies absorbed over 16 percent of our supply in the first half of 1942.

As previously stated, use patterns change, which may have a bearing on future calculations; but at least it is safe to say that to date no shutdowns or delayed production of war materiel have occurred due to a shortage of zinc. As to the future, with reservations only with respect to the unforeseeable, given the necessary domestic mine production and ore imports, present scheduled smelting and refining capacity should be sufficient to provide all our own war needs, as well as those of our Allies. As is the case with practically all metals, civilian uses, unless essential, are not likely to get much consideration so long as direct military demands majntain.

Lead Has Old and New Tasks in the War

Production from mines in the Western Hemisphere during the first year of war has readily met all essential needs

By FELIX E. WORMSER

Secretary and Treasurer
Lead Industries Association

ONE YEAR of war has brought about a notable change in the lead situation. From an apparent scarcity early in 1942 the lead supply has grown to a point where essential demands are being readily filled, including all the requirements of the armed forces as well as civilian applications. The change has been brought about largely by the Government's policy of conservation and of importing all the lead possible from foreign lead-producing countries, especially Mexico, Canada, Australia and Peru. Indeed, it was fortunate for the foreign producers that they had the huge domestic market of the United States, expanded to war size, available for the disposition of their pig lead. Without it there might have been serious internal problems for the foreign producers and their governments.

By issuing Order M-38-c in January, 1942, controlling the applications of lead, that is, prohibiting its use in some non-essential applications, and restricting some uses to 90 percent of the amount used for a similar period in 1941, the War Production Board effected immediate savings in pig lead. No restrictions, of course, were placed on the use of lead for military contracts or for uses of lead necessary in scientific, medical, public health and safety, and some agricultural applications.

The order drastically curtailed some uses of lead foil and it disappeared swiftly from cigarette packages. Prior to the war lead foil had been extensively used by the tobacco industry, with the market also being shared by cellophane and by aluminum foil. After aluminum no longer became obtainable, lead took its place and the tonnages moving into the foil industry grew to substantial proportions. It will be interesting to observe after the war is over how the two metals make out in again competing for the tobacco foil market. War has brought about improvements in the foil industry which permit the rolling of foil to much thinner dimensions than formerly thought possible. This augurs well for the ability of foil to compete with non-metallic coatings which, in turn, have made heavy inroads on the metallic wrapping field.

As a result of the Government's foresighted policy of conservation and stimulation of production, and because direct military requirements—such as lead for munitions, storage batteries and cable, solder and other uses—were comparatively modest, the Government soon found itself in possession of a constantly growing stock pile, one which had reached a point at the year end which placed the metal in a more comfortable position, ready for any emergency, than it had been a year ago.

The Government is making an effort to use lead intelligently throughout industry in order to conserve scarcer metals and materials, particularly, copper, zinc, tin, chromium, cadmium, aluminum, nickel, rubber and even steel. Many opportunities exist to do so because, as is well known, the metals can be used interchangeably in numerous applications. The lead industry naturally hopes that an intensified interest in lead from all directions will result in developing new uses, some of which may be retained after the war to help the industry in meeting peacetime competition. Some new uses already have the earmarks of being partial displacements of other materials.

Use of Lead Coatings Greatest in 10 Years

For example, the shortage of zinc, cadmium, chromium, nickel and tin has made it desirable to turn to lead wherever possible as a coating metal on steel items. I believe more thought and study has been given to the difficult technique of applying lead coatings properly in the last year than for the preceding ten years. One large manufacturing enterprise is coating a large quantity of pole line hardware with lead, the items to be used under atmospheric exposure conditions. Lead coating is not a difficult process but the coating has to be completely intact with no pin holes, otherwise trouble is apt to arise from staining or rusting. The electro-chemical relationship between lead and iron is different from that between zinc and iron and to overcome this inherent characteristic of lead, which works to its disadvantage, the lead coating must be as devoid of pin holes as possible. However, recent research has indicated that when staining does occur it is generally of a superficial nature and does not affect the fundamental utility of the coating even though it may impair its appearance.

Strangely enough, lead-dip coatings are of lighter weight than galvanized coatings, so that, for military equipment where weight is a consideration the prospect of using lead has definite advantages. I don't think lead coating will supplant galvanizing in all directions, but I do think it will be used more after the war than it has in the past, especially where severe industrial atmospheric exposure conditions are found. Today lead coating appears to serve best on smaller steel items such as clamps, bolts, washers, plates and rods.

Another development of great interest at this time is the use of lead in collapsible tubes. Heretofore the tubes in which shaving cream and toothpaste were packed generally consisted of pure tin, or lead with tin inner liners, or aluminum. Because of the shortage of tin there has been a gradual conversion to a pure lead tube for shaving cream and one with a small amount of tin for toothpaste. These tubes are coated internally with a resinous varnish which provides protection against contamination from the metallic content of the tube.

Lead base bearing metals are not a new development but the replacement of tin-base bearing metals by high lead content bearing metals should do much to conserve tin. Considerable work has already been done by manufacturers in this direction.

Lead can also save some inorganic materials that are critical at the moment, particularly rubber. Like lead, rubber can be used in contact with highly corrosive sulphuric acid.

In fact, the term chemical lead is due to the high degree of corrosion resistance to chemicals such as sulphuric acid displayed by that grade of lead. By using larger tonnages of lead in many industries employing sulphuric acid, such as the rayon industry, substantial savings can be made in rubber—enough to recap many an automobile tire in the United States.

Lead plumbing systems ordinarily depend upon a few brass fittings such as ferrules, flanges and nipples for proper installation. Necessity being the mother of invention, the lead industry has devised similar fittings made of antimonial lead which serve the purpose admirably and should make it unnecessary to return to brass after the war is over.

Antimonial lead has a stiffness that soft lead does not possess and is also being employed for die cast items in military equipment, and naval equipment. Work is constantly going on to see whether it can not be more widely adopted than it has been to replace the scarcer high-grade zinc in die cast operations.

An extremely interesting chemical use of lead, and one that has grown to great importance in the United States, is the use of tetraethyl lead in gasoline. The addition of only a few cc. of ethyl fluid to a gallon of gasoline increases the octane ratings of most gasolines appreciably. Today, when there is also a gasoline shortage it would seem to be the better part of wisdom, as a conservation measure, to use more ethyl fluid in gasoline, particularly for high compression engines.

Name plates on machinery have generally been made of bronze or brass, lead being considered too soft. However, some lead name plates recently have been manufactured of antimonial lead that are not only attractive in appearance but durable enough for all the service to be expected from such an application.

In building construction industry lead can perform excellently where metallic flashings are employed and can save copper, galvanized iron or terne plate, whatever the specification may be. Generally a thin antimonial sheet is recommended so as to cut down weight and cost. Even so, the thickness of lead used is generally much greater than that of other metals and the protection afforded against corrosion equal to the life of the building.

The largest single use of lead in war, as in peace, remains its application in storage batteries and here the lead battery is available to save nickel.

For the conservation of tin, a solder made of lead containing from 2 to 6 percent silver has been developed.

There are many miscellaneous new uses of lead, such as its application in mechanical pencils or in hardware. Recently a manufacturer was considering its use to manufacture padlocks. We may look forward as long as the war continues to seeing lead applied to what may ordinarily appear as odd applications.

Lead Has Unique Chemical Properties

Lead paints are outstanding for their durability, and here again they are available, particularly white lead and red lead, to conserve other pigments should shortages develop.

Lead is unique among the common metals in that it is used commercially, more than any other metal, for its chemical properties rather than its physical characteristics. Iron is used largely in the metallic form although the oxide is found in paint. Copper, likewise, is used chiefly in the metallic form or as a constituent of alloys. It is true there are certain chemicals, important to industry, such as copper sulphate. Zinc has several chemical applications, particularly zinc oxide that consume large amounts of the metal, but where is there a situation comparable to lead with the large use of the metal in chemical form—for example, as an oxide—litharge in storage batteries; again as a different oxide in red lead; as a carbonate to make white lead; as a salt, lead arsenate, to protect our food supplies from insects; or as an organic compound to help us use gasoline to best advantage, tetraethyl lead?

No mention has been made of the direct use of lead in ammunition where its weight and low cost are advantageous. Modern small arms cartridges use lead as a bullet core rather than as the principal metallic component. Steel is now the more important constituent of the bullet itself. Nor is lead finding much application in shrapnel or cannister.

Owing to the unavailability of steel for packaging purposes an opportunity has been given to the foil industry for the development of a combination package consisting of a stiff cardboard box enclosing an inner liner of laminated foil and tar paper. The inner liner is of such construction that it is completely flexible and protected on the inside by a layer of cellophane so that there will be no contact between the metal foil and the product packed. This is an excellent illustration of a use of foil to save other metals in an essential everyday article—the "tin" container.

This war is so vast and so destructive that no one knows how many tons of non-ferrous metals will ultimately be required to defeat the enemy. No doubt it will, if long continued, have a very noticeable effect on our domestic ore reserves. But one thing is sure, no enemy country is so well situated with respect to lead supplies as the United States. Not only do we have the largest reserves in the world but we can draw upon the supplies of Canada and Mexico—by rail—to help out if need be.

In conclusion, so advantageous is our position that today lead can carry the load indefinitely of furnishing not only the indispensable supply of lead for bullets, storage batteries, bearing metals and other war materials but it can help also to ease the burden on other metals.

Underground ore pocket of a lead mine in Southeastern Missouri

Manganese, Chromite, and Molybdenum

Both private and Government funds are being directed to the production of manganese and chrome ores. Molybdenum output expected to increase about 15 percent in 1943.

IN PRE-WAR YEARS the imports of manganese more than matched normal requirements; the United States now counts on domestic production, largely from low-grade ore, to meet from 25 to 33 percent of our essential needs. Manganese is an absolute requirement in every pound of steel produced, non-alloy as well as alloy types. Normally, for every ton of steel produced, about 13 pounds of manganese are required. Manganese, acting as a purifying agent, makes steel sound and clean.

In 1940 imports totaled 1,294,000 long tons of the metal—more than enough to meet requirements. In that year United States production was only 40,000 tons. The main sources of foreign supply, in order of importance, were the Gold Coast, the Union of South Africa, Brazil, India, Russia, Cuba and the Philippines.

Every effort is being made to increase imports from sources still open to this country and to step up domestic production to the maximum with existing facilities. Remarkable success was achieved in 1942 in the expansion of domestic output; even more encouraging results will be apparent during 1943.

As a result of careful planning, the manganese situation is today the best of any of the alloying metals. The U. S. stockpile alone, even if not increased by a single pound, could supply our needs uninterruptedly for two years.

The United States had normally produced only small amounts of manganese because deposits in this country are largely low-grade, and the engineering and technical problems involved in recovering manganese from domestic ores have been somewhat difficult to solve.

But now, utilizing new methods of recovering manganese from domestic deposits, American producers are obtaining large amounts of the important metal. The two most important domestic projects are located in Montana and Nevada, while additional amounts are being received from smaller mines in Arkansas, Utah, South Dakota, Georgia and Tennessee. Both public and private funds have been used to finance this important phase of America's war effort.

Prospective sources of additional production are at Artillery Peak, Ariz., and Chamberlain, S. Dak. A drilling program has been under way in Aroostock County, Maine, by the M. A. Hanna Company, prospecting a manganese deposit. Results so far obtained are reported to be encouraging.

Banks of flotation cells in a large molybdenum concentrator

CHROMIUM

In 1936, we used 324,258 tons of chromite ore, all but 269 of which were imported from Africa, Cuba, the Philippines, and Turkey. This gives a fair picture of what we were up against when foreign supplies were threatened. By 1940, when war had spread, consumption doubled over 1936, and imports increased considerably. But domestic production was still only 2,666 tons out of 657,689 tons total supply.

To meet military and essential civilian requirements in 1943, we will need about three times the tonnage used in 1939. And this includes cutting civilian needs to something like three percent of the total.

Large low-grade deposits of chromite ore have been developed in Montana, California and Oregon. These ores are not of high quality, but are adequate in an emergency. The Reconstruction Finance Corporation is providing over $10,000,000 for chromium projects, and private industry is adding several million more. The net result will be a domestic output in 1943 as large as imports in prewar years.

War needs will require more chromium this year than we used for all purposes in an average peacetime year. And next year, requirements again will be heavily increased.

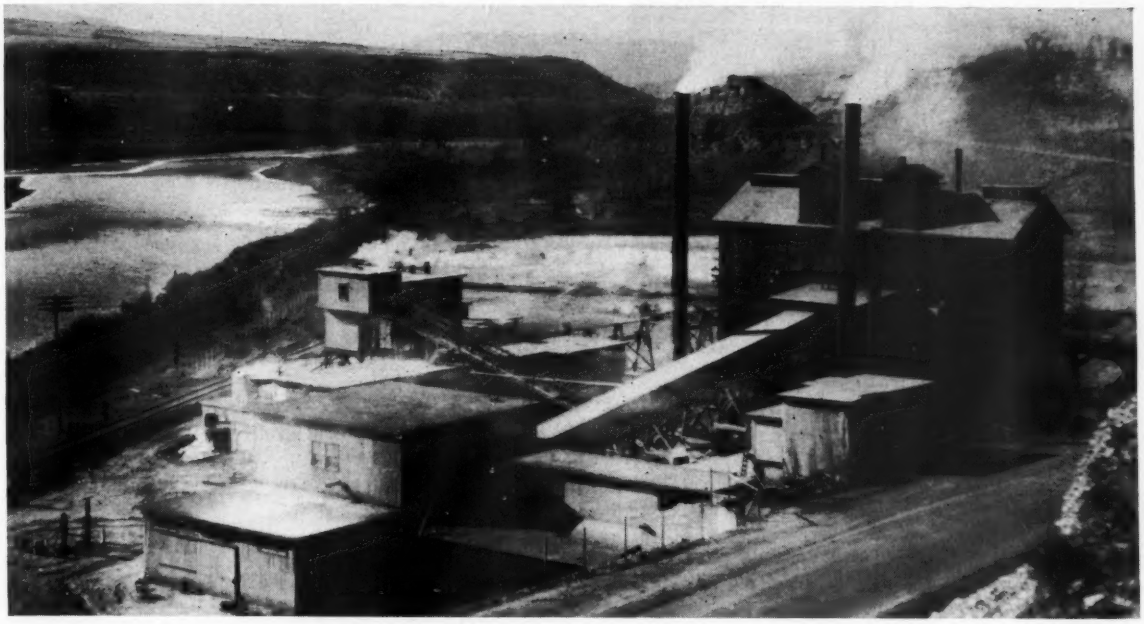
MOLYBDENUM

Molybdenum used to be a refreshing spot in the welter of materials shortages that followed on the heels of all-out war production, since we produce well over 85 percent of the world's supply.

Molybdenum imparts some characteristics to alloy steels that no other metal does, although in many cases, other alloying metals are interchangeable. In the early stages of war production, molybdenum was widely substituted for tungsten, chromium, nickel and other more scarce alloys. As is the case with any juggling of supply, a state of balance arrives very quickly, and the formerly plentiful metal becomes just as short as the ones for which it was being substituted.

Normal domestic production was about twice the domestic demand, thus a large part of the production was exported. With the coming of the war and a curtailment of exports, there was an excess of production, which was carefully stockpiled.

Domestic supply will increase about 15 percent in 1943 and in addition, new explorations are being carried out on old and new properties once thought too unproductive to work. If results are favorable, several million additional pounds will become available for the war program.



Vanadium plant of the U. S. Vanadium Corporation, Colorado

Vanadium Output Indicates Vigorous Progress

Expansion of mining operations in two western states is held encouraging for domestic supplies of this critical metal, as well as interesting for the geologist. "From Sandstone to Steel" typifies the 1942 war story for vanadium.

By BLAIR BURWELL
General Superintendent
United States Vanadium Corp.

DEVELOPMENTS in the sandstone-vanadium deposits of Colorado and Utah resulted in a sharp increase in the rate of output, and the opening up of several new producing areas. Since 1935 the output of vanadium from this region and from ores of this type has shown a steady annual increase. Six treatment plants were in production at the end of the year, compared to one in 1935. The region promises to continue to supply the largest part of our domestic output of vanadium in 1943.

Prior to 1942 the production of vanadium was largely centered in western Montrose County and western San Miguel County, Colorado. Here the Uravan plant of the United States Vanadium Corporation, the Naturita plant of the Vanadium Corporation of America and the Slickrock plant of the North Continent Mines produced vanadium oxide from deposits first developed in World War I for the production of radium.

This productive area covers only a small amount of a large region in the intermountain plateau of Colorado and Utah, in which sedimentary rocks favorable for the occurrence of vanadium are exposed. This larger potential region has been but little developed due to the inaccessibility of much of the region and lack of roads, or to the smaller size of the deposits and the economic factors involved.

Before December of 1941 the principal operators in the district, together with the U. S. Geological Survey, the Bureau of Mines and the Government agencies concerned with the production of vanadium, prepared plans for the development of this previously undeveloped portion of the vanadium-bearing area. These plans involved the opening up of the districts with main and access roads, the establishing of ore-buying stations in the region to give a market to small miners and producers, and the providing of Government plants near the various new ore areas to treat this production as well as from former marginal deposits that would be placed in production.

Leaching tanks, Durango vanadium plant

Under direction of the Bureau of Public Roads and the Grazing Service of the Department of the Interior, approximately 300 miles of roads were completed during the year, giving access by truck to many mining districts which were formerly inaccessible except by pack mules and trails. The United States Vanadium Corporation, acting as agent for the Metals Reserve Company, established ore sampling and ore receiving stations at a number of places in the region and provided a market for ore mined from newly opened areas. The Vanadium Corporation of America completed a salt roasting plant at Monticello, Utah, for the Defense Plant Corporation, and purchased ores from similar newly opened regions tributary to Monticello for treatment at that plant. This company also operated their enlarged plant at Naturita, Colo., on ores from the Placerville district in Colorado of the roscolite type, as well as carnotite ores mined from the district tributary to Naturita.

The United States Vanadium Corporation, for the Metals Reserve Company, rehabilitated and rearranged for vanadium recovery, idle smelter and roasting equipment at the plant site of the American Smelting and Refining plant in Durango, Colo. This plant, together with the Monticello plant, was placed in production in the latter part of 1942.

As a result of this development the sandstone-vanadium producing area was greatly extended by the end of the year, and operations were underway in a great number of scattered mines extending from the Navajo Indian Reservation in northern Arizona northward to Green River and Thompson, Utah.

In a somewhat similar manner mining operations in the Rifle, Colo., district were extended into new producing areas during the year. The Rifle area was productive from 1925 to the year 1932, when higher-grade ores were exhausted in the Rifle Creek mine of the United States Vanadium Corporation. However, in this mine, as well as in surrounding areas, there remained marginal ores lower in grade. The United States Vanadium Corporation completed a two-furnace salt roasting plant at the site of the former plant in February of 1942, and operated throughout the year on ores from the Rifle mine, together with ores purchased from small miners in tributary regions. This new plant contributed largely to the 1942 output. Development work and diamond drilling were actively carried on at Rifle, and production on an increased rate is anticipated in 1943.

Under the stimulus of a ready market demand for ores, prospectors in the Coal Creek district in Rio Blanco County, near Meeker, Colo., opened up a number of producing properties in 1942. The United States Vanadium Corporation assisted in this development by financing the construction of access roads and in the providing of a market for the ores which were transported to the plant at Rifle, Colo., by truck for treatment.

The Rifle Creek mine of the Garfield Vanadium Company near Rifle, Colo., was equipped and placed in production during the year to supply ore to the Metals Reserve Company. This property is located on the west side of Rifle Creek, and joins the United States Vanadium property on the east. By the end of the year this property was producing 40 tons per day of vanadium ore.

Developments continued at Slickrock, Colo., in western San Miguel County, where the North Continent Mines increased capacity by the installation of a salt roasting plant in the latter part of 1942. This company also mined ores for the Metals Reserve plant at Durango.

The Blanding Mines operated on

Building containing roaster units, Durango vanadium plant

Surface mine of vanadium ore near Cottonwood Canyon, Utah

Cottonwood Creek, west of Blanding, Utah, during the early part of 1942. However, this plant was destroyed by fire in midsummer and a new unit to replace the original plant was under construction in the latter part of the year. The plant of the Gateway Alloys Company at Gateway, Colo., also operated on a small scale during the year, and plans were made for doubling the capacity in 1943.

The increasing importance of sandstone-vanadium ores as a supply for our war needs, and the expansion of exploratory work into new areas, increased the study of and discussion of the geological reason for this unusual type of ore. In this, as in the majority of such questions of genesis, there exists a considerable difference of opinion.

The principal problem in the mining of the ores is in interpreting the ore structure and following the irregular course of the deposits. For this reason the development of a geological concept of the occurrence to serve as a guide for mining has been important. This concept is that the deposits were the result of the deposition of vanadium-bearing muds and sands in the depressions and channels of the meandering intermittent flood plain of Juriassic time. The source of the material making up the lenticular assembly of the ore-bearing Morrison member was probably made up of pre-existing ancient sediments containing vanadium-bearing material of the asphaltic residue type. Under intermittent flood erosion conditions the lenticular Morrison assembly was built up of alternate barren and vanadium-bearing muds and sands. While secondary migration and re-precipitation have in many places obscured the primary syngenetic vanadium muds and developed a great number of secondary minerals, it is usually possible to identify the primary ore deposition and develop the local rock structure in the course of mining. Many of the orebodies of the region have thus been developed by working out the original bedding structure and channels of deposition in the rocks. In the Rifle mine, meandering bedding of vanadium ore has thus been followed for continuous distances of over 4,000 ft., and in the Paradox regions the ore deposits of the Club and Long Park districts have been followed for similar distances.

Slushers for Mining and Many Trucks Required to Move the Ore

The actual mining and removal of ore is conducted in a variety of ways, dependent upon the size and location of the individual deposit. In the larger channels or ore zones the mining is conducted by drifts and tunnels using underground loaders or scrapers where the deposits are of sufficient regularity and size. Openings are usually started as drifts or tunnels on outcrop exposures, followed by inclined shafts as the development and mining proceed along the trend of the mineralized beds away from the outcrops. In the larger mines, such as Rifle, Colo., a regular system of slusher mining is used, with motorized underground haulage.

Diamond drilling by vertical holes from the surface, is extensively used to guide the mining in following the ore-bearing beds, and is usually used to supplement the mining by providing information ahead of development faces. It is less extensively and less successfully used to "wild cat" areas away from mining openings or surface outcrops.

Production from the district is entirely dependent upon trucks and approximately 1,000 tons of material per day are moved over distances up to 150 miles. On better roads, and in the more developed regions, diesel trucks and trailers are used to transport loads of 25 tons, and smaller trucks of 10-ton capacity on lesser roads. Truck transport management is a large part of the production problem of the region.

Work on the metallurgy of ore treatment during the year resulted in the addition of acid leaching equipment at the Uravan and Naturita plants, to supplement the salt roasting and water leach process. Many of the ore deposits in districts newly opened are less responsive to the simple salt roasting treatment, due to an increase in lime content over safe salt roasting limits, but yield to a dilute acid leach of the calcined and water-leached ore. Problems of mechanical handling of this auxiliary recovery step have been worked out, and it is anticipated that acid leaching will be installed in additional plants in 1943.

Pioneer road building to vanadium ore deposits in Colorado

Magnesium from Sea Water and Dolomite Supplies War Effort

Rapid expansion in the production of this important metal marks an outstanding achievement that will also contribute much in the post war era.

By GEO. A. BILQUE
Chief, Magnesium Fabrication Section
Aluminum and Magnesium Division, WPB

METAL FROM SEA WATER! The man in the street is captivated by the wonder of it. The free and abundant supply of the Atlantic Ocean, the Pacific, and the Gulf gives him a feeling of security. This can never be shut off by any foreign power or by sabotage. He has heard of magnesium, the metal one-third lighter than aluminum, which has made great contributions to the development and advancement in airplane engineering. Sources other than sea water, though less spectacular, are the underground salt brines, magnesite and dolomite, all in great abundance.

Of its other uses he knows little, and is generally astonished to learn that, while today its entire production is devoted to direct war use, in pounds, more magnesium goes into incendiary bembs that are devastating our enemies' factories and in powder for flares and tracer bullets, than into planes.

Early in 1941, the only producer of magnesium in the United States was Dow Chemical Company. This company, at its Michigan plant used, as at present, the brines of the underground lakes of Michigan. In Texas, Dow also produces magnesium by the electrolytic process but from magnesium chloride obtained from sea water instead of from brine. To meet the increasing demands of war activities, construction of new plants was started. Basic magnesium at Las Vegas, Nev., utilizing the low-cost power of Boulder Dam and using the electrolytic process of Magnesium Elektron, Limited, of England, got under way. Another Dow plant in Texas, the Diamond plant in Ohio, and the International Minerals & Chemical plant in Texas, started construction, all using the electrolytic process. Additional plants were needed but further demands for power on an industry already overtaxed by expansion of aluminum and other industries could not be met.

Other processes, though of untried value, were being developed. The Advisory Committee on Metals & Minerals of the National Academy of Sciences, choosing the process that offered the best opportunities for production without loss of time, recommended the ferro-silicon method. In this process calcined dolomite is mixed with ferro-silicon, briquetted and charged into retorts where the magnesium is driven off in a vapor and condensed in the ends of the retorts. True, this process demanded additional ferro-silicon furnaces, but new furnaces to supply ferro-silicon could be erected more easily than could power facilities necessary for additional electrolytic plants. As in most new processes, difficulties have been encountered, but they are rapidly being overcome, so that in addition to the eight plants constructed, or under construction, for the production of magnesium in electrolytic cells, six plants were quickly started by the Defense Plant Corporation to use the ferro-silicon process. Previous to the declaration of war, Permanente had built a plant which used the carbothermic reduction of magnesium oxide and vapor condensation, to produce pure magnesium from Nevada magnesite. Though having the usual "ups and downs," this process is now in successful operation.

With increased production, large research and engineering staffs are developing new processes of fabrication which undoubtedly will be the basis of a wide use of this metal in post-war industries. However, in the war effort it is used almost exclusively for aircraft, incendiary bombs, powder for photo flash, flares and tracer bullets, and alloying with aluminum.

Expansion of fabrication plants kept pace with increasing magnesium production. Foundries in depressed industries were and are being converted to the use of magnesium. Grey iron and non-ferrous metal foundries find their skill adaptable to the use of magnesium. Their knowledge of sand handling, core making, molding, and pattern making is of great value. Much of their equipment can be used, but generally they must put in new melting furnaces equipped with steel melting pots. In addition, heat treating and aging furnaces are needed, also pyrometer installations, as close temperature control is essential. Good ventilation is also imperative.

Producers and foundries have been generous in sharing their engineering knowledge and experience with new plants, training unskilled employes and introducing economic and safe practices. Until skill is developed, an excess of defective castings must be expected. Experienced core makers

Pier construction for pipeline to a plant where the magnesium chloride will be recovered from the sea water

and core fitters are desirable, as aircraft engine castings are intricate and often require a large number of cores. Die casters find it comparatively easy to fit magnesium to their practices, but only cold chamber machines can be used. Permanent mold casters also find little difficulty in adjusting their plants to the use of magnesium and are enthusiastic as to its future. Magnesium sheet rolling, though still in its infancy, is being rapidly developed by drawing on the knowledge gained in the rolling of other metals.

"Rough finished" castings are supplied to the prime contractors who do the machining. Magnesium is easily machined, and women are being trained to do much of this work. Special process lathes which are frequently set up for individual plant operation, speed up production. Magnesium, due to its excellent workability, readily lends itself to screw machine operation. Castings are easily and quickly trimmed with band saws.

Surface finishes of magnesium are generally of lacquer and paint, which give best protection against corrosion. To provide a good base for paint, fabricated parts are pickled in a dichromate solution.

Alloys with characteristics suitable for fabrication of presently required products have been developed and standardized. American Society of Testing Materials' symbols are used to designate these alloys. But new processes demand new alloys, and research is constantly going on in laboratories devoted solely to this work.

In time of war, such an important and critical material must be controlled to insure its most effective use. To do this, the flow of metal from the producer to the fabricator is controlled by allocation. Secondary ingot is allocated in the same manner as primary metal.

Magnesium in dolomitic limestone is recovered from the crushed rock by means of a calcining and ferro-silicon process

Field men frequently call on users of magnesium products to instruct plant operators in the proper segregation of scrap. In this way it may be returned for use through the secondary smelter without losing its alloy character or being contaminated with other metals.

The amount of detail involved in fitting magnesium into the war program is considerable. The requirements of each claimant agency, such as the Aircraft Scheduling Unit, the Army and Navy, Lend Lease, and also industries requiring magnesium for alloying must be carefully estimated. Research and engineering are constantly uncovering new important uses for this metal, and the War Production Board is striving to anticipate these new uses and have facilities and supply available when needed. The supply is allocated accordiing to importance, as indicated by war strategy, and particular care is taken to keep a balanced program. Reports are tabulated and studied, in order to maintain close control over the use and flow of this metal.

When the history of the war is written, considerable mention will be made of the part magnesium has played in its winning. In the meantime, a new industry is brought into being that will contribute greatly to the wealth and advancement of this country.

Close-up showing method of pouring three-notched magnesium ingots

Tungsten Mining and Ore Dressing Greatly Advanced

Domestic production since the last war has progressed from a period of stagnation to one of considerable activity

By CHAS. H. SEGERSTROM
President
Nevada-Massachusetts Company

THE IMPORTANCE of tungsten in our wartime economy is one that is little understood among the laymen, and its importance among the strategic metals is so great that it is sometimes referred to as "Key Metal" of them all. During the first World War its importance was fully recognized, and the bidding for tungsten concentrates became so great that stock piles were purchased as part of the economic warfare. As a result of competitive bidding between Germany and the Allies at that time tungsten concentrates reached the high price of $125 per short ton unit in this country. Such high prices encouraged prospecting and several milling plants were built, therefore many deposits were opened in the United States during that time which might otherwise have been undiscovered and undeveloped for many years.

There are many uses for tungsten. Its chief use is as an alloy in making highspeed tool steel. These tool steels have the properties of holding their hardness even when used at a red heat, therefore, they can be used at greater speeds and with heavier cuts than ordinary carbon tool steels.

Tungsten steels are also used in the manufacture of valves and valve seats for internal combustion engines. These units are invaluable in our airplane engines. There are many complex tungsten steel alloys which are used for special purposes, such as tungsten steel used in heavy duty shear blades for cutting hot metals; razor blades, knife blades, files, hacksaw blades, drills, transformer cores and hundreds of similar products. Tungsten, tantalum and lanthanum are now being used in glass making for lenses.

Tungsten is also used in the form of tungstic carbide, and this particular production has increased tenfold in recent years. Finely ground tungstic carbide is sintered into a solid mass with minutely ground cobalt or other binder, and this forms the hardest known cutting tool except the diamond.

During the present emergency tungsten and molybdenum have been used in nearly equal parts in making tool steels instead of the customary 18-4-1 standard high speed tool steel. This change was made in order to conserve both metals. This has resulted in a saving of both tungsten and molybdenum, so that we and our allies may be better supplied with these necessary alloys for other types of work.

Tungsten in World War I and II

The commercial production of tungsten in the United States began about 1903, at which time little was known of the properties of tungsten. We received most of our supplies of high speed steel from Europe. This continued until about the time of the beginning of the first World War, when we were called upon to manufacture equipment and guns for France and England. It became apparent at once that the use of high speed tool steel was imperative in order to speed up our war production, thus, the demand for tungsten grew to unprecedented amounts. The consumption in the United States arose from practically nothing to about 18,000 tons in 1918.

The first World War period was followed by a severe depression in tungsten production due to the fact there was no duty on the ores or concentrates, and these were shipped here from large stock piles held by the Allies and Germany at the conclusion of the war.

When the Armistice was signed, tungsten concentrates of good grade were selling in the United States at $25 per short ton unit. Immediately prices dropped rapidly, so that by March, 1919, tungsten concentrates were sold in New York City at $1.75 per short ton unit. This necessitated the closing down of every tungsten mine in the United States, and for five or six years tungsten mining remained stagnant.

In 1922 a duty of 45 cents per pound of W contained was placed on foreign imported tungsten concentrates. This was afterwards increased to 50 cents per pound. At first this duty did not show the benefits which it should have produced due entirely to the fact that so much ore was available from the stock piles of the world, which were being liquidated at very low prices. Another factor was the discoveries of tungsten in China. This opened up a very cheap source of tungsten, because labor was secured for 18 cents a day or less, and American miners could not compete.

This condition of the tungsten continued until about 1926-27, when prices in the United States rose to about $11 per short ton unit, duty paid for foreign concentrates. Tungsten mining then resumed in a small way, and just prior to the depression production had increased rapidly in the United States.

During the depression years, production again slumped to a very low level. Beginning in 1933 and up to the present time, production has increased rapidly in the United States. At the present time this country is producing about two or three times the normal consumption of tungsten concentrates used in the domestic industry in pre-war days.

The reason for this rapid increase in production was the excessive demand for concentrates in all the markets of the world. Both Germany and Russia, beginning in 1936, purchased all available concentrates. This resulted in a price of $27.50 per short ton unit in the United States. In Europe as much as $35.00 per short ton unit was paid for tungsten concentrates.

The most important of the recent discoveries were those in the Yellow Pine District of Idaho, near Bishop, Calif., and at Golconda, Nev. These new discoveries give the assurance that with fair prices in post-war days, the United States should remain independent of the outside sources for its supplies of tungsten for domestic purposes. The use of portable ultra violet light units in prospecting for scheelite has resulted in finding several deposits which are now supplying tungsten for the war industries.

In 1942 the Metals Reserve Company announced that it would purchase domestic ores at $24 per short ton unit WO_3 under certain conditions, and in the fall of 1942 they announced that new eligible production would be purchased at $30 per short ton unit, freight prepaid to eastern points, less certain penalties for impurities, etc. Non-eligible producers were declared to be those who had produced more than 100 tons of tungsten concentrates in 1941, and they were not included in the benefits of the $30 price. Therefore, at the present time, there are two prices for tungsten concentrates:

(1) The sale to and purchase by the Metals Reserve Company at the $30 price, less freight and penalties;

(2) The open market price for non-eligible producers, who sell direct to consumers under allocation by the War Production Board.

During the past year prices have fluctuated from $24 to $28 per short ton unit for non-eligible tungsten concentrates averaging 60 percent WO_3 and having average impurities. This difference in price is due to the fact that some concentrates command a premium, while others are sold at a lower price due to certain impurities and the complex condition of the concentrates.

Research Contributes Better Recovery from Ores

During the last five years many advances have been made in the metallurgy and ore dressing for treatment and milling of tungsten ores. The first important improvement was made by the successful flotation of scheelite. This was the result of research carried on by the United States Bureau of Mines and many private sources. Pilot plants were built by United States Vanadium Corporation near Bishop, Calif., and the Nevada-Massachusetts Company at Mill City, Nev. The Nevada-Massachusetts Company erected a 75-ton pilot plant at Mill City under the direction of George Crerar, metallurgist, and Ott F. Heizer, manager. They succeeded in floating scheelite after many unsuccessful attempts, and this was probably the first commercial plant to float scheelite in the United States.

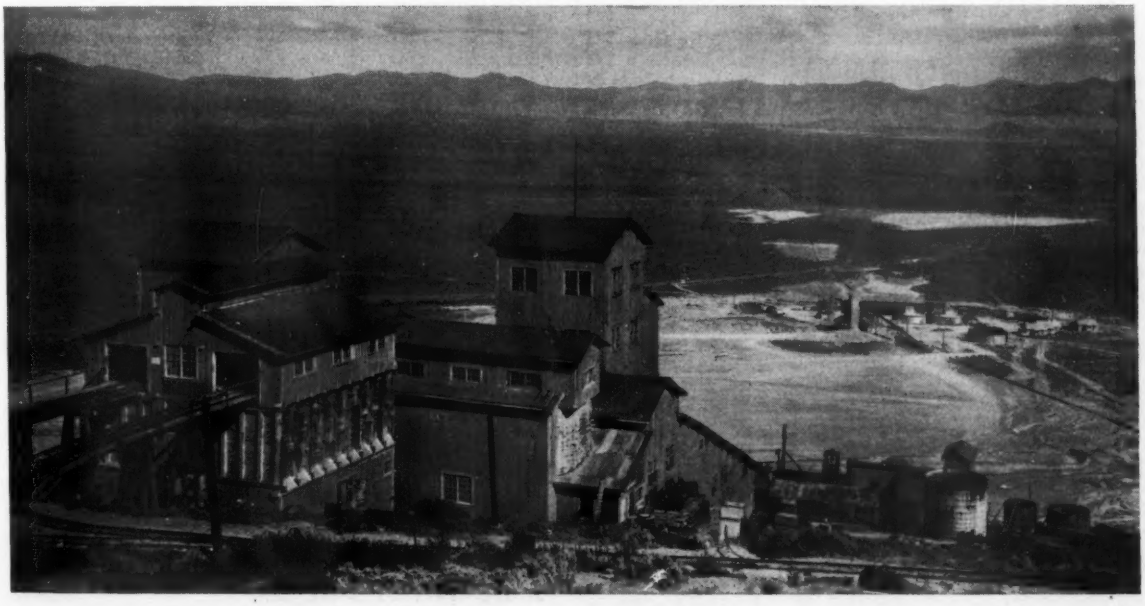
The Atolia Mining Company also erected a flotation plant at Atolia, Calif., where they succeeded in floating tailings made from previous operations, and re-treating them with hydrochloric acid, making concentrates, which after leaching, averaged about 50 percent WO_3. This plant was later enlarged and now has a capacity of about 300 tons per day.

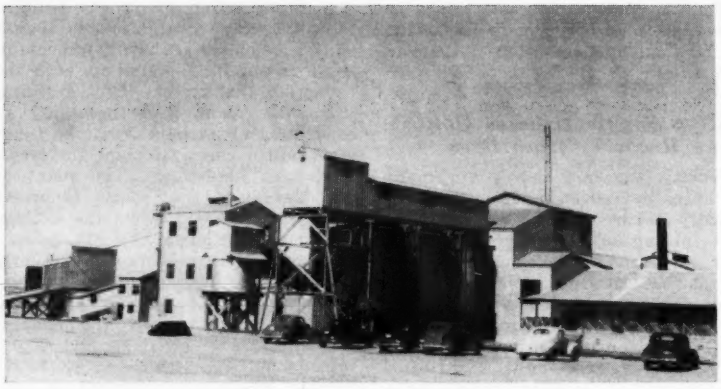
As a result of flotation tests in the pilot plants, the United States Vanadium Corporation erected a 1,300 ton per day mill at Pine Creek, about 21 miles from Bishop, Calif. A 1,000 ton per day flotation plant was built at Mill City, Nev., by the Nevada-Massachusetts Company. The flowsheets of these two mills are similar, with the exception that at the United States Vanadium plant it is necessary to separate molybdenum from the tungsten, and a chemical plant for treatment was necessary. The plant of the Nevada-Massachusetts Company at Mill City, Nev., treats the tailings from the 250-ton gravity mill, as well as tailings from storage. Recently they successfully worked out a flowsheet which requires no additional chemical treatment of the concentrates, and a finished product is obtained that contains from 68 to 75 percent WO_3.

This last development was made possible through the research of Philip McGuire, W. G. Emminger and O. L. O'Reilly, with the assistance of American Cyanamid and Chemical Corporation, at the laboratories of the company at Mill City. With this new flotation a high grade concentrate is produced that is treated in a hydrochloric acid plant, floated and roasted. Heretofore, the flotation froth was passed over the slime tables and only one-half of the product was suitable to make a concentrate which average 70 percent WO_3; the other half was made into a table tail which averaged 4 or 5 percent WO_3, and these tailings were shipped to the plant of the United States Vanadium Corporation at Pine Creek for chemical treatment.

At the Bradley Tungsten Mine plant at Stibnite in the Yellow Pine District of Idaho, a similar flowsheet is used. The mill was enlarged to 500 tons per day and high grade antimony and tungsten concentrates are made.

Two Western tungsten concentrating plants





A modern plant for producing tungsten

It is necessary to further treat these concentrates to remove by-products that are present, and they are shipped for retreatment.

Many smaller mills are equipped to mill the ores by flotation, and it has recently become standard practice. Low grade concentrates can be shipped to the Salt Lake City, Utah, plant of the Vanadium Corporation, which is prepared to handle such concentrates.

The real importance of this successful flotation of scheelite in the United States is probably not fully understood. The discovery, having been made prior to our entrance into the war, has been of great assistance in making available large amounts of tungsten concentrates. Under the old method of gravity concentration on tables, jigs and other means, the possible extraction was only 60 to 85 percent of the tungsten contained in the ore, while with flotation, it is possible to extract nearly all of the scheelite contained in most ores that are milled.

Chemical Treatment for Low Grade Ores

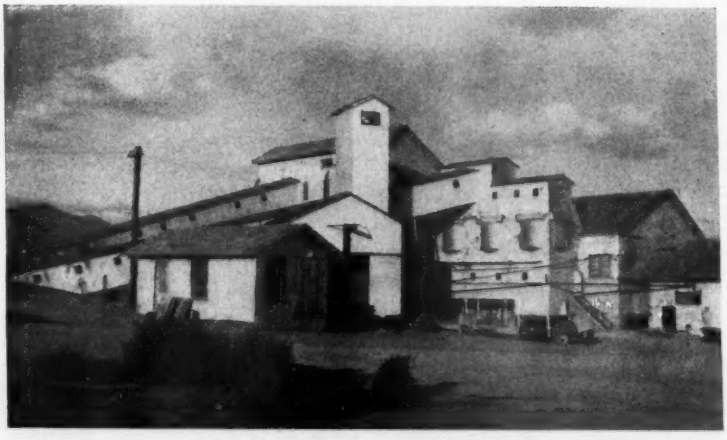
Another important step in domestic tungsten production has been the chemical treatment, which takes ores or low grade concentrates and reduces them to a chemical state in the form of sodium tungstate, either by treating with soda in an autoclave, or by sintering on a Dwight-Lloyd furnace. Low grade concentrates or ores, which could not otherwise be treated or the impurities removed, are now made into a good high grade artificial scheelite in the form of calcium tungstate. The flowsheet is complicated and treatment is expensive. Three plants have been built which employ these methods; one at Pine Creek by the United States Vanadium Corporation; another now under construction for the Defense Plant Corporation to be operated by the United States Vanadium Corporation at Salt Lake City, Utah, and the plant of the Golconda Division of the Nevada-Massachusetts Company, at Golconda, Nev.

The United States Vanadium Corporation's plants use the autoclave method, while the plant of the Golconda Division of the Nevada-Massachusetts Company uses the Dwight-Lloyd sintering machine. There are many other tungsten properties in operation and in the development stage. From the standpoint of mines in operation it appears safe to assume that production in 1943 should be at least equal to the 1942 production. There are many factors, however, which affect production and which are disturbing to the producer and miner; the greatest being the gradual reduction in the grade of ore which is being mined, as the better grade ore in most of the deposits has been already depleted. The second is the ever increasing costs of labor and materials.

The labor situation remains critical; not only is it difficult to obtain skilled men, but the hourly rates of pay are nearly double those of normal times, and with time and one-half for the sixth day and double time on the seventh consecutive day of work, we may reach a point during the coming year when a great many of the mines will either have to be subsidized or the price of tungsten concentrates increased. This problem is one that calls for a decision by the War Production Board in conjunction with the Metals Reserve Company and the RFC. They have been most helpful in assisting the tungsten industry in these trying days, and both officers and men, together with the Bureau of Mines and the Geological Survey, and other agencies, are all doing their utmost to facilitate the work in the production of tungsten.

During past years there has been considerable agitation toward the reduction of the duty on tungsten concentrates from foreign countries. However, with the assistance of the American Mining Congress, the American Tungsten Association, Federal and state agencies, together with Senators and Congressmen, those interested in the production of tungsten have submitted briefs and statements showing that any reduction in the price of tungsten would be fatal to American production. Our State Department has not included tungsten among the items on which the duty was to be reduced. We hope this attitude will continue, as it is impossible to pay high wages to American miners and compete with the low paid foreign labor in other tungsten producing countries.

At present tungsten sales are allocated by the War Production Board through Miles K. Smith, of the Ferro-Alloys Division. This department has been generous with its assistance to those engaged in tungsten mining, in helping them to obtain the necessary priorities and materials, as well as securing men to help relieve the manpower situation. This, together with the assistance now being given by the Metals Reserve Company, the RFC and other Federal agencies, will, we trust, during the coming year give American tungsten miners an opportunity to show the world they, too, can do their part in making an Allied victory possible.



A tungsten mill near Atolia, Calif.

Mercury Remains on The Strategic List

Domestic production made another gain in 1942, but consumption demands increased. Supplies from mines in Canada and Latin American countries assure the war program of its requirements. Greater exploration and development scheduled in 1943.

By GORDON GOULD
H. W. Gould & Co.
San Francisco, Calif.

FOR THE THIRD successive year the quicksilver production of the United States has exceeded any prior year back to the bonanza years of the 70's and early 80's. Although production and consumption figures have necessarily had to be withheld, there is little doubt that production increased almost as much in 1942 as it did in 1941. Because of the strong market during most of the year and the apparent large scale imports, it must be concluded that consumption had likewise increased—quite possibly more than production. Quicksilver continues on the list of strategic metals and, as one of such, has been subjected to certain controls or regulations and also has been favored by tax and tariff legislation.

The principal production, as in previous years, has come from California, with Oregon as the second largest producing state. Alaska, Arizona, Arkansas, Idaho, Nevada, Texas, Utah, and Washington contributed the remainder. As usual a large proportion of the production came from few mines, many of which have been substantial producers for many years.

Although there were no notable discoveries of new mines within the United States during 1942, several properties came into full production during the year or added substantially to their ore reserves or plant capacity. Ore reserves in quicksilver mines, unlike those in many other mines, have always been an uncertain quantity. Because of the erratic occurrence of cinnabar, and the fact that quicksilver mines are relatively small, the financial requirement for the development of ore reserves has more often than not been more than could judiciously be risked. During 1942 several mines, which had the advantage of a successful year in 1941, reinvested a large part of their earnings of that year in substantial development campaigns. These privately financed development programs together with the extensive work of the Geological Survey and the Bureau of Mines has unquestionably been responsible for much of the increase in production.

Although it is impossible to review all of the private and Geological Survey or Bureau of Mines programs, there are several which may be noted as important in relation to production in 1942 and potential output in 1943. The Hermes Mine in Idaho entered regular production in 1942, and, together with increased plant capacity, will probably show a substantial increase in 1943. Extensive diamond drilling has indicatd ore reserves which should permit operations to continue for several years at an increased rate. The new Idria Mine in California has developed quite extensive reserves of good grade ore through diamond drilling, underground exploration, and intensive geological study that will undoubtedly increase production again during 1943. The Klau, Mt. Jackson, and Socrates Mines in California are developing new ore reserves at greater depths, and with more extensive lateral development in 1943 output should increase. The Smith and Wilson property in Texas, a newcomer to the larger production group, promises to be a substantial producer this year.

Plant Expansions Account for Greater Production

The Arkansas field apparently has reached a regular and consistent production schedule. The work of the Geological Survey and Bureau of Mines in most of the quicksilver districts has been very helpful to many of the other producers and must have augmented our known reserves, though certainly by an indefinite quantity. The very erratic occurrence, previously mentioned, together with the fact that in most of the California mines the ground mining operations makes it almost impossible to survey the industry for an accurate estimate of ore reserves.

Increases in production were recorded at several properties largely on the basis of plant expansion. The Reed, Klau, and Mt. Jackson mines in California, the Hermes mine in Idaho, and the Silver Cloud in Nevada added additional furnace equipment. The Cordero mine in Nevada increased its plant capacity, originally put in operation in the summer of 1941. There were quite a number of smaller operations on which new plants were placed for the first time during the year. Although the plant expansion programs mentioned have contributed to increased production, mine development has been far more important. Likewise, for 1943, while there may be other expansions, it can be fairly assumed that production will be determined almost entirely by the success of development in the currently producing mines.

Basic metallurgical procedure remained unchanged throughout the year, the principal changes being confined to refinements in existing processes. Although there are a few exceptions, standard processes continue to roast the ore, without any prior attempt to concentrate, volatilizing the quicksilver within the furnace or retort, and then to condense the quicksilver in suitable condensing systems. The bulk of the ore being roasted is handled in rotary kilns with hearth furnaces and retorts making up the balance.

Consumption figures and distribution of quicksilver to the various industries are not available for 1942. It is well known, however, that rather large quantities are being imported principally from Mexico and Canada, and these added to our increased domestic production indicate that consumption is far above normal figures. Quite satisfactory substitutes have been developed for fulminate and antifouling paint, two uses heretofore generally believed to be prime war requirements. On the other hand, many new uses have been developed and the quantity going into the "standard" chemicals and pharmaceuticals has increased manyfold. The demand by industry, despite conservation or

New Idria quicksilver mine where geological mapping and study has added substantially to the ore reserves

limitation orders, is way up. It is very likely that when it is possible to release information on the consumption during the past year that the producing industry will be amazed at the diversification of consumers and products for the metal. This may be of great significance in the postwar period in that developments made during the war might help materially in softening the crash expected after the emergency.

Like other industry, the quicksilver producers and consumers have had to follow governing regulations made necessary by the war effort. At the beginning of the year two important actions were taken which affected both producers and consumers. Conservation order M-78 prohibited in some cases and regulated in others the consumption of quicksilver. The least essential industries were denied the privilege of obtaining any metal whatsoever; other somewhat more essential industries were permitted to consume a percentage of their normal requirements; and essential industries, working on Government orders, were actually helped in obtaining metal either from producers or, if this was not available, from the Metals Reserve Company stockpile.

Also early in the year, the Office of Price Administration, in an attempt to stabilize prices, fixed a maximum or ceiling price on quicksilver. Using the Pacific Coast as a base point, the maximum price chargeable by a producer was established at $191 per flask. Brokers and dealers were allowed to add 2 and 1 percent, respectively, and so with equal freight additions, the maximum price to the consumer was regulated throughout the country. Although it is impossible to know the ratio between supply and demand, the price has not fluctuated as greatly as usual during the past year and for the past several months has ranged within $5 of the ceiling price.

About the middle of the year the Metals Reserve Company announced a plan which was of great importance to the new and smaller producers. Although they had previously purchased quicksilver for stockpile and allocation purposes this new plan offered contracts to eligible producers in which they guaranteed to take all or a part of their production at $188 per flask f.o.b. buying depots until December 31, 1943. This provided the smaller producer with an assured outlet for his production for some time advanced, and in several instances, proved to be the incentive necessary to bring a new mine into production. It likewise indicated to the larger producers that the strong market was not a bubble that would soon burst and consequently influenced development programs and plant expansions accordingly. At about the same time Metals Reserve Company purchased rather large quantities in the open market, thereby helping to maintain the price and continued incentive for further exploration, development, and production.

The general wage and labor stabilization measures enacted during the year were probably of the same importance to the quicksilver producers as to other industry. Higher labor costs, shortage of manpower, and problems of training new personnel have all affected the industry to a greater or lesser degree but probably proportionately with other industry. The proximity of many of the California mines to centers of war activity have, in many instances, made conditions more severe in relation to obtaining labor and competing with the higher wage scale prevalent in these activities. Another factor of considerable importance is that due to the smaller size of the industry there are fewer semi-skilled or skilled laborers to choose from, and further the disruption caused by the loss of just one man or the training of new men is proportionately greater.

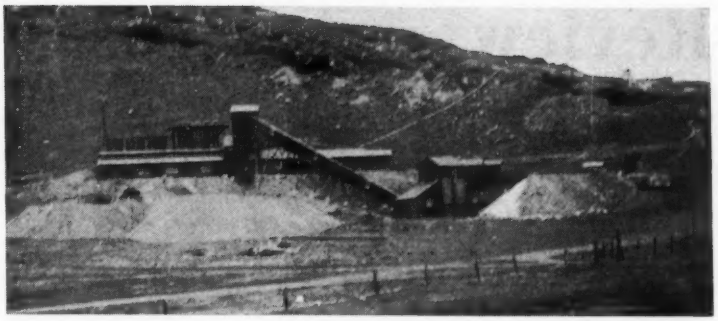
On October 5, 1942, the War Production Board called the first meeting of the Quicksilver Producers Industry Advisory Committee. This committee was invited to work with the WPB to get together in an attempt to create a closer relationship between industry and the war program and should prove very helpful.

The final adoption of the 1942 tax bill regained for the quicksilver producers exemption from an excess profits tax, which exemption they had had under the 1940 law along with other strategic metals. In 1941 the exemption was excluded and further exclusion would have threatened development programs, exploration, and even production. The matter of defining "gross income" as it relates to including furnacing costs in the calculation of depletion credit is still at issue and unless the long established method can be maintained it is quite possible that this might act adversely on production. The American Mining Congress has been very helpful in their efforts on each of these problems.

On December 23, 1942, the U. S.-Mexico trade pact was signed. This reciprocal trade agreement includes a long list of tariff concessions and during the discussions and negotiations quicksilver had been listed for possible tariff reduction or even elimination. Although the industry had expressed a willingness to accept such a reduction or elimination for the duration of the emergency, it was not affected and the tariff of 25 cents per pound remains unchanged.

An Appraisal of Foreign Mercury Production

Because of the pre-war relation between domestic production and consumption, during which we produced approximately one-half of our requirements, it is necessary that we look at our present problem of production and consumption beyond our own borders. Lack of definite information again prevents an accurate analysis of foreign production, however, some interesting approximations can be made. The Italian production is positively Axis controlled and probably has been geared to war propor-

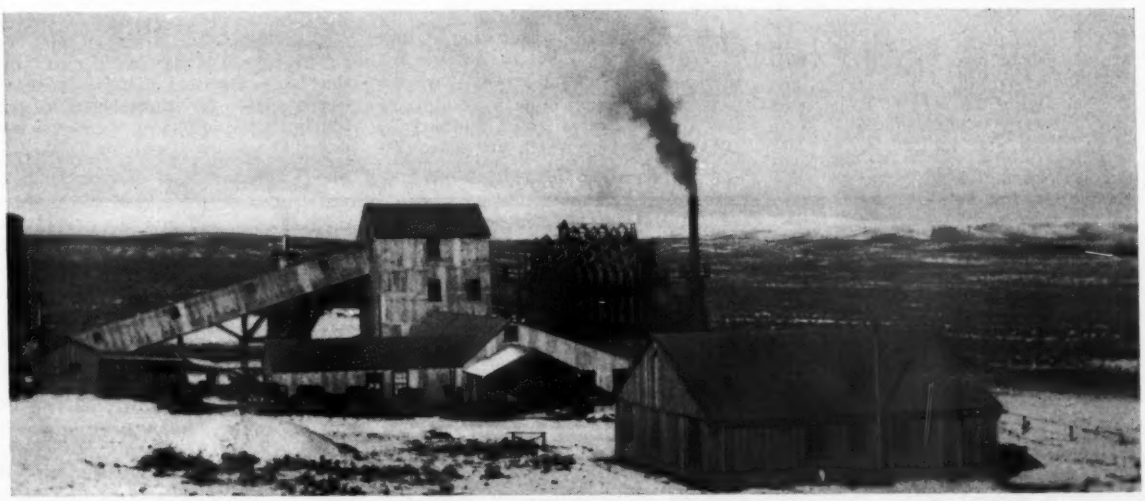


A quicksilver producer in California

tions. Spanish output, in part at least, must by deduction be assumed to be going to the Axis, however, it is more than probable that a part of the British requirements are still being supplied from Spain. The large American requirements cannot be met by domestic production and are being augmented largely by Mexican and Canadian mines. Mexico has increased production to a greater extent than have American mines, both by development and discovery. Efforts of the past two or three years will probably make Mexico more important in world production than it has ever been before. Canada, which before the war had only produced a trifling amount of quicksilver, is now an important producer. The one principal mine in British Columbia is today probably the largest single producer in the Western Hemisphere and reportedly has developed extensive reserves. Another property in the same area is currently being developed and may well be of similar importance. Quicksilver properties are being extensively prospected, developed, and in some instances equipped in Alaska, Central, and South America. The extensive development throughout the Western Hemisphere is the answer to the difference between American production and requirements. While American mines have responded to the demand for greater production quickly and importantly, we must look to the rest of the hemisphere for a large proportion of our requirements. This period might well mark a shift in the important producing areas with the United States production becoming relatively less important. American mines are mostly old, they are mostly quite small, and they have been pretty thoroughly worked. Districts have been prospected and very few new mines have been discovered in recent years. Such mines as have been found in recent years usually have been worked out rather quickly, or do not show promise for large and continued production. American mines in general are working on lower grade ores than are the quicksilver mines in any other country. New developments throughout the Western Hemisphere, exclusive of the United States, all offer stronger possibilities for large production through prospecting and developing higher grade ores in new districts and through equipping them with modern and efficient equipment.

Although production within the United States was increased in 1942, it was expected as a natural result of the higher metal price and time required since the beginning of the war to get new or larger plants into production. I do not feel, however, that the present rate of increase can be maintained through 1943. Increases in production in 1940 and 1941 were largely the result of many small mines, easily and quickly put into production, augmenting the more substantial producers. The higher rate for 1942 was the result of attainment by the larger producers of increased plant capacity and reward for development programs initiated in 1940 and 1941. The mortality, however, of the new mines of 1940 and 1941 was very high in 1942 and indications are that in 1943 many more may go. Such new mines as came in in 1942 were mostly smaller than those of the previous two years and although the number of producers was larger their sustained productive capacity will be less.

Despite prospects for increased production outside the United States, the importance of exploration and development within the country cannot be overemphasized. If allowed to remain inactive for even short periods of time most of the larger mines would be very difficult to reopen. Approximately two-thirds of the domestic production is within 100 miles of the Pacific coastline so that strategically they are quite vulnerable. Though relatively a small industry, quicksilver is most important to the war program, as well as to peacetime industry, and it is cooperating for the successful prosecution of the war.



The mercury recovery plant of the Cordero Mining Co., Nevada

Iron Ore—Review and Preview

Production from the Lake Superior District broke an all time record in 1942. With development and rehabilitation of iron mines under way in other parts of the Nation, the industry is prepared to meet the increased war demands in 1943.

By M. D. HARBAUGH
Vice President and Secretary
The Lake Superior Iron Ore Association

THE IRON MINING INDUSTRY of the United States, by shipping approximately 107.5 million gross tons of iron ore (including Lake Superior manganiferous ore) in 1942, exceeded the previous year's record movement of 93,548,000 tons by 15 percent, and that 1941 tonnage exceeded by more than 22 percent the next highest movement which occurred in 1917. Of the output in each of the past two years, the Lake Superior district, embracing Minnesota, Michigan and Wisconsin, shipped about 86.5 percent; the Southern district, including Alabama, Tennessee, Georgia and Missouri, about 8.5 percent; the Eastern district of New York, New Jersey and Pennsylvania, 3.5 percent; and the remaining 1.5 percent came from the Western states—mainly, Wyoming, Utah and California.

This large output of ore has met without difficulty the greatly expanded war-time requirements of the iron and steel industry of this country, as well as of the Canadian province of Ontario, which also depends largely on U. S. lake-borne ore. And as the blast furnace capacity is still being increased, by construction of new furnaces and by enlargement and rehabilitation of existing furnaces, the ore to be supplied in 1943 is expected to exceed the 1942 movement by 8 to 10 per cent.

The incidence of the war, long before the U. S. entry, was promptly reflected in the increased activity of the iron and steel industry, with consequent increases in ore requirements. By the autumn of 1940, steel ingot production in this country had reached near-capacity rates, which it had not done since the last World War, and capacity was increased during that year nearly 2½ million net tons to bring it to more than 84 million tons by January, 1941. As is indicated by the following table, steel ingot (plus steel for castings) capacity greatly increased in 1941 and 1942, and will not reach the contemplated maximum of more than 98 million net tons until about September, 1943.

Increase in blast furnace capacity necessarily parallels that of steel, and of course more directly reflects the increased demands for ore. Twenty-four new furnaces built or building in the United States since January 1, 1941, the last of which are scheduled to be completed by mid-1943, plus numerous rehabilitations and enlargements, account for the expanding capacity for production of pig iron and ferro-alloys since 1940.

Most of the added blast furnace capacity necessarily is in the areas mainly dependent on Lake Superior ore. Some of this capacity in the east will absorb most of the increasing output of magnetite ores from the Eastern district, although open hearth furnaces will also use part of that product. Other new furnaces are in Alabama, Texas, Colorado, Utah and California—all to use ore from those states, except that one Texas furnace will use Mexican ore in part, and the Colorado plant uses Wyoming ore. Practically every long-idle furnace in the country has been or will have been rehabilitated and placed in operation prior to the spring of 1943, some of them being moved to new locations.

In Ontario, one large new furnace was added in 1941, a small one rebuilt and put into operation in 1942, and another large furnace will be completed about mid-1943. These also add to the demands for U. S. ores.

THE LAKE SUPERIOR DISTRICT

The lake and rail shipments from the Lake Superior district in recent years speak for themselves in portraying the picture of increased output. These are shown in Table 2.

TABLE I

U. S. STEEL AND PIG IRON CAPACITY AND OUTPUT—1936-1943

	Five years 1936-1940, inclusive average	1940	1941	1942	1943 Estimated	1943 Sept. Estimated
Steel Ingots and Steel for Castings—						
Capacity January 1: Net tons	79,989,000	81,619,000	84,152,000	88,570,000	93,735,000	98,280,000
Production—Net tons	52,334,000	66,983,000	82,928,000	86,092,000		
Rate of operation	65.4%	82.1%	98.5%	97.2%		
Pig Iron and Ferro-alloys—						
Capacity January 1: Net tons	55,029,000	54,731,000	56,629,000	60,394,000	64,440,000	70,850,000
Production—Net tons	35,192,000	46,071,000	55,918,000	59,982,000		
Rate of operation	64.0%	84.2%	98.7%	99.3%		

TABLE II

LAKE SUPERIOR IRON ORE SHIPMENTS, 1937-1942—MONTHLY BY LAKE, AND ALL-RAIL FROM MINES

(In Gross Tons—Railroad Weights)

	1937	1938	1939	1940	1941	1942
By Lake—U. S. and Canada:						
March	.....	.....	.....	.....	.....	792,602
April	3,770,555	260,514	56,793	464,669	6,954,793	7,857,106
May	10,043,856	1,180,703	3,601,453	7,274,024	11,081,199	12,677,356
June	10,107,883	2,837,745	5,572,998	9,525,494	10,789,929	12,625,102
July	10,704,457	3,267,813	6,309,938	10,433,488	11,390,488	13,405,506
August	10,811,380	3,325,715	6,960,103	10,534,431	11,496,303	13,235,862
September	9,173,991	3,284,800	7,891,031	9,998,618	10,311,517	11,847,919
October	6,562,035	3,624,416	9,201,249	10,061,127	9,596,064	11,417,074
November	1,424,679	1,481,305	5,472,605	5,341,386	7,660,987	7,582,425
December	.....	.....	6,549	14,547	835,081	635,829
Total from U. S. Ports	62,598,836	19,263,011	45,002,085	63,352,768	79,654,785	91,603,910
Total from Michipicoten	.....	.....	70,639	360,214	461,575	472,871
Total by Lake	62,598,836	19,263,011	45,072,724	63,712,982	80,116,360	92,076,781
All-Rail:						
United States	587,281	286,023	436,010	595,061	1,093,967	(Estimated)
Canadian	.....	.....	39,349	1,171	.....	(Estimated)
Total All-Rail	587,281	286,023	475,359	596,232	1,093,967	1,400,000
Grand Total*	63,186,117	19,549,034	45,548,083	64,309,214	81,210,327	93,477,000

* These totals vary slightly from the total "mine" shipments.

TABLE III

LAKE SUPERIOR ORE—GROSS TONS

	1937	1938	1939	1940	1941	1942
Consumption:						
At U. S. furnaces	52,913,121	24,874,538	43,479,682	61,033,157	74,570,871	83,714,451
At Canadian furnaces	1,082,955	828,512	881,337	1,393,157	1,764,811	2,511,018
Total	53,996,076	25,703,050	44,361,289	62,426,314	76,335,682	86,225,460
Stocks at Furnaces and Lake Erie Docks: (U. S. and Canada)						
May 1	14,632,000	33,676,000	22,791,000	18,106,000	16,937,000	20,064,744
December 1	42,626,000	37,456,000	40,732,000	41,712,000	45,535,000	53,703,458

Navigation at the U. S. Soo canals officially opened on March 22 last year, for the first March shipments in the history of the ore movement, and closed on December 17. However, the first ore boat passage upbound was on March 23 and the last downbound on December 12.

The largest movement in any year prior to 1941 was during the World War in 1916, of 66,672,000 gross tons, and the next largest in 1929, of 66,166,000 tons. By comparison, the low point, when only 3½ million tons was shipped in 1932, shows what violent fluctuations have occurred. The average shipment in the decade ending 1940 was about 34 million tons, but a fairly normal tonnage would be considered 45 to 50 million. Thus, the tonnage of 81 million in 1941 was unprecedented, and the nearly 93½ million tons in 1942 was beyond contemplation even two years ago. The indicated total movement for the 1943 season is about 100 million tons.

In addition to being favored by a long season and a reasonable amount of fair weather, the great ore movement in 1942 was accomplished through the combined efforts of the mining organizations, the railroads and the lake carriers, all cooperating effectively under the general direction of the War Production Board and the Office of Defense Transportation. A total of 306 vessels of American registry, having a combined trip capacity of more than 2,800,000 gross tons, and 35 Canadian vessels, engaged in the ore trade last season. This fleet of bulk carriers also moved 48,390,000 net tons of coal in return movements as a supplemental and essential part of their operations, during the ore season.

The vast tonnages of ore, coal, limestone, scrap, grain and many other commodities that move so readily on the Great Lakes testify to the incalculable importance of these waterways to the productive enterprises of this country and of Canada, and more especially in time of war.

Five large new ore carriers, built for the Pittsburgh Steamship Company, were put in service in 1942, and the coming season will see sixteen more new vessels in service—constructed for the U. S. Maritime Commission and expected to be operated by several of the present shipping companies.

Protection of the lake shipping facilities and of the restricted channels has engaged the attention of various departments of the Federal and the respective state governments during the past year. The Office of Defense Transportation has planned supplemental dock and rail facilities to move additional ore via Escanaba, on Lake Michigan, in case of need to by-pass Lake Superior temporarily, in shipping Minnesota ores. Construction of the new docks and preparatory work for the other facilities has been under way for some time.

Consumption of Lake Superior ore and stocks on the significant dates in recent years are shown in Table 3.

Monthly consumption, which averaged more than 7½ million tons in the last quarter of 1942, will continue to increase until about June, 1943, when the last of the new consuming capacity dependent on lake ore is expected to be in operation. By May 1, 1943, there should be a safe balance of ore available at furnace yards and docks of about 16½ million tons in addition to the new season tonnage delivered prior to that date. Hence, furnaces are not likely to suffer any spring shortage of ore. Maintenance of their recent high rates of ore consumption, plus consumption by new and rebuilt furnaces yet to come into blast, are expected to boost the requirements for blast furnace and open hearth use to approximately 96 or 97 million tons during the calendar year 1943, and to 2 or 3 million tons more than that for the 12 months ending May 1, 1944, or even more if the scrap supply for open hearth furnaces should fall further short of needs, resulting in an extraordinary tonnage of ore being required for open hearth use.

In a recent War Production Board

report, released by Donald Nelson on December 24, 1942, annual ore requirements to meet the full proposed iron and steel capacity in the United States are stated in Table 4 (the original figures in net tons here being converted to gross tons):

TABLE IV

Source	Thousands of gross tons
Lake Superior	100,100
Eastern	5,500
Texas and Missouri	800
Southern	9,500
Western	3,700
Total	119,600

The WPB figures evidently include the enlarged Ontario requirements of approximately 3½ million tons, of which about ½ million tons is now supplied by Canadian production and the balance by U. S. mines. The eastern tonnage is expected to increase ultimately to between 7 and 8 million tons, and this will relieve somewhat, the demand upon Lake Superior ores. However, since imports at the Atlantic Seaboard have ceased, after a considerable tonnage was received early in 1942, the added eastern production helps also to offset this loss which is now being made up largely by Lake Superior ores.

Thus, in general, are outlined the ultimate annual demands upon the Lake Superior district needed to maintain the personnel necessary to perform the assigned task in 1943.

More Men Will Be Needed to Meet Scheduled Output

Employment in the mines of the U. S. ranges averaged about 23,000 men during the 1942 shipping season and has fallen off but slightly during the winter. Extensive stripping, construction and rehabilitation of plant and equipment, conversion of haulage, and other activities at open pit mines have been and are being carried on in preparation for new and enlarged operations; and underground mines are fully active this winter and stock piling their output. It is estimated that from 6 to 8 percent more employes will be required next season to meet the scheduled output. Notable losses to the armed forces and to other industries have occurred during the year, but it is hoped that some arrangement can be provided to maintain the personnel necessary to perform the assigned task in 1943.

Open Pit Conveyor Installations And Use of Trucks Increasing

Space is not available to comment on all the recent and pending activities relating to new and renewed operations designed to help meet the demands for ore. With the deepening of open pits and the need to release ore tied up in track benches, the shift from rail and locomotive haulage to truck and conveyor operations is continuous. At least six new open-pit conveyor installings are being made, and many properties equipped with additional trucks and small excavating shovels. Notable is the extensive increased use of small trucks, dumptors, wagons and tractors in the pits —up to the largest—for handling and moving ore within the pits to the main haulage systems. Much stripping is being done this winter to extend operations of many existing mines and for opening new ones. Likewise several extensive unwatering projects are under way, or are planned, to permit mining of heretofore inaccessible ore —notably at the Mountain Iron mine, which was the first shipper on the Mesaba range in 1892 and has been idle since 1908. Pumping of 1½ billion gallons of water from this pit reopens a reserve of 25 million tons, to start production in 1943. Other proposed operations involving vast water removal are at Embarass Lake, on the Mesaba Range, to open several new mines for production in 1943; also at Steep Rock Lake, and in the Michipicoten district—both in Ontario.

Several new ore washing and concentration plants have been constructed in Minnesota and were put in operation in 1942 and others are planned or proposed. Notable is the increase in number of "heavy density" or "sink and float" plants and of concentrate produced thereby. Additional installations of such plants are proposed at two or more locations in the near future. Output of wash and gravity concentrate, including the "hi-density" product has shown amazing increase in the past two years. Concentrate shipments increased from about 9 million tons in 1940 to nearly 15 million tons in 1941, probably reached about 17 million tons in 1942 (figures not yet available) and will be greater in 1943.

Particular study is being given by various operators to the problems of taconite concentration, and two laboratories have been established at Hibbing, Minn., for this purpose. Experimental work on various low grade ores also is being carried on at laboratories of the state educational institutions and elsewhere. Accompanying the widespread interest in concentration of the taconites has been at least one surface drilling campaign on the eastern Mesaba to discover additional areas of the magnetic type of rock.

A substantial tonnage of bog limonite shipped in 1942 from deposits in Fillmore County in Southeast Minnesota, after treatment in a central washing plant, is rather an innovation in the Lake Superior region. This all moved by rail to Granite City, Ill.

In Michigan, the railroad haulage of the Plymouth open pit, in operation since 1916, gives way next season to an outside inclined skipway, fed by trucks moving the ore in the pit. New activity preparatory to shipments in 1943 at several long-idle properties in the old Crystal Falls district is giving a new lease of life to that area. Elsewhere important new mines are the Sherwood, in the Iron River district, opened in 1942, and the Mather, near Ishpeming on the Marquette range, to begin shipments in 1943. The Mather promises to be the most spectacular underground mine in the Lake Superior region, with an attractive setting, superb surface plant, large and well equipped shaft—planned to go to 4,000 ft. in depth, and a reserve of high grade ore expected to provide a long-lived operation. The shaft is now at about 2,400 ft., and mining is to proceed this year from two levels above that.

Interest Centers on Future Sources of Iron Ore Supply

While the expanded, new and renewed mine operations in the Lake Superior district are most conspicuous in the picture, these are being partly offset by the exhaustion and closing down of other mines; also development of underground ore has not been able to keep pace with the rapid depletion of these mines the past year or two, partly for lack of time and men to do it. The drain of recent large production of all the mines is telling upon the reserves of the district, and the results are inevitable. It is obvious that a few years of 100 million tons output—more than double the normal —will largely deplete the known reserves of the easily mined direct shipping and readily concentrated open-pit ores. Underground operations cannot take their place, even though underground reserves are comparatively large, hence the current widespread interest in the future production of concentrate from quarried taconites—the iron-bearing formations of the Lake Superior ranges. The estimate one makes of the length of the war, of course, makes all the difference in one's present outlook as to the imminence of dependence on the taconites. There apepars no reason for concern about the ore supply to meet the actual war needs—unless the war goes on for more years than now seems likely. But obviously, it is the part of wisdom to prepare for the future with full recognition of the rapidly changing situation as to reserves. And this change, with the high rates of extraction, naturally is of more immediate concern to some producers and consumers than to others.

Operators in industry long have recognized that eventually, when the high grade and the easily concentrated ores

are largely exhausted, furnace requirements of the consumers would have to be supplied by concentrate produced from the taconites, unless, foolishly, the industry were to yield its markets to foreign ores. The war brings this problem much nearer than had been anticipated. Yet there is reason to believe that this mining industry which long has proved itself able and resourceful, given freedom to act and permission by the tax gatherers to retain a fair share of its earnings to expend on the necessary exploration, research and costly plants and equipment, will long continue to meet the future demands upon it for the raw material for iron and steel. It is unthinkable that, as a nation, we should ever permit our security and self-sufficiency to be impaired, and the welfare of vast industries in the most populous areas of our country to be threatened, by dependence upon foreign sources of iron ore, despite probable post-war pressure to import large quantities of such ores which may then be accessible.

OTHER DISTRICTS EXPAND PRODUCTION

Eastern.—While the Eastern district is second in tonnage of the three lesser iron ore districts of the United States, its output is mainly very high grade magnetite sinter and lump, 62 percent to 68 per cent iron, which is consumed in eastern furnaces that, in part, are supplied also from Lake Superior. Hence, its expanding output is of particular significance in relieving to some extent the burden upon the latter district. By 1944, annual output from New York, New Jersey and Pennsylvania is expected to be nearly double the tonnage produced in recent years through 1942, the increase coming mainly from four new mine operations in New York and three in New Jersey. The McIntyre mine, high in the Adirondacks in Essex County, opened in 1942 by the National Lead Company as a source of titanium dioxide for pigment, began shipping by-product magnetic iron ore concentrate in August and will be one of the large producers henceforth. Eventually its product will be sintered before shipment. The Clifton mine of the M. A. Hanna Company in southern Lawrence County, made a small shipment from open pit operations in 1942 and will be in substantial production from both open pit and underground in 1943. Benson Mines of Jones and Laughlin, also in Lawrence County, and the Fisher Hill mine of Republic, near Mineville, New York, are expected also to get into production about mid-1943 for very substantial tonnages. Full operations of Republic Steel Company's other mines at Mineville and Lyon Mountain were maintained in 1942 and are expected to continue at about the same rate of output. The new and enlarged operations in New Jersey by Warren Pipe and Foundry Company, Alan Wood Steel Company, and West Portal Mines will nearly double the New Jersey output in 1943 and still further increase it in 1944. While ore reserves in deposits throughout the Eastern district are believed to be extensive, they are far from fully known or developed as yet.

Southern.—Output of hematite and brown ore in the Southern district in 1942 exceeded that of 1941 by more than a million tons to meet the increased demands occasioned by three new blast furnaces in Alabama, put into operation in 1941 and 1942. Alabama contains the largest iron ore reserves in the United States outside the Lake Superior district, assuring the future supply for the iron and steel plants of the important and growing southern industrial region for a long period. The fact that coal and flux are available close to the ore gives these plants a significant advantage.

Texas will be added to the southern producers in 1943, to supply two new blast furnaces, one at Houston—near the Gulf, and the other Daingerfield—in the north ore-producing district. The ore supply consists of extensive surficial limonites mainly in Cherokee County, in the "south basin," and in Cass and Morris Counties, in the "north basin," all in the northeastern part of the state. The ores are to be mined in open cuts, using power shovels and trucks, and transported to central treatment plants for crushing, washing and other beneficiation to make shipping products of 44-45 per cent natural iron, high both in silica and alumina, and with phosphorus ranging from a little below 0.1 per cent to over 0.3 per cent. Iron has long been made from these ores in small furnaces—the first of which were erected about 1850, and nearly three quarters of a million tons of ore have been produced for this local consumption. No furnaces have operated there since about 1911. The U. S. Bureau of Mines has estimated the reserves in both basins at 150 to 200 million tons, scattered over some 90 square miles.

Southeastern Missouri is supplying some hematite and brown ore from small scattered deposits, the product going to the blast furnaces at Granite City, Ill. A campaign of exploratory drilling of the hematite at Iron Mountain was carried on during the past year.

Western.—Production of iron ore in the western states, while not materially changed in volume from 1941 to 1942, is scheduled to be increased by more than 2 million tons in 1943, and about another million thereafter, to meet the greatly expanded requirements of three western states. One new blast furnace was added to the Pueblo, Colo., plant in January, 1942, resulting in expanded operations at the Sunrise mine in eastern Wyoming, on which this plant depends, although the output at the mine is understood not yet to have reached the ultimate tonnage. The ore is non-bessemer, and runs about 53 per cent in natural iron. Near Provo, Utah, and at Geneva, about 10 miles to the north, a total of four additional blast furnaces to be placed in operation during 1943 will multiply by several fold the iron ore tonnage heretofore mined in Iron County in southwestern Utah. Three large new furnaces are being erected as part of the complete new steel plant at Geneva. The other furnace was removed from Illinois and is being rebuilt as the second furnace at the present Provo plant. The Utah ore is of good non-bessemer grade, about 55 per cent in natural iron, and the reserve is indicated as adequate.

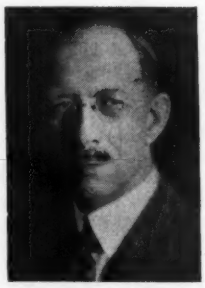
At Fontana, near San Bernardino in southern California, the new Kaiser blast furnace, connected with the new steel plant there, has just been put into blast—the first one in California. There are several excellent ore deposits in that region available to it, the deposit at Eagle Mountain, about 100 miles southeasterly in Riverside County, being the largest. However, it is understood that the initial ore is coming from another area, pending completion of plans for production and shipment from Eagle Mountain.

New Records Will Be Surpassed

The fact that the iron ore industry has made an enviable record in its war task thus far, naturally is gratifying to those engaged in it and in allied and tributary industries. But with even greater demands ahead, and ensuing greater difficulties in maintaining or providing the personnel, tools and transportation necessary to meet these demands, there is no disposition to be comfortable, to relax and look backward. It is apparent, from all the recent and present activity in operating mines, at properties being readied for operation, in preparations of all sorts preliminary to the ensuing shipping season, and in plans for future years, that nothing is to be left undone to assure the continued supply of iron ore for maximum operation of the furnaces as long as is required. And perhaps, when its war task is completed, and reconstruction of a battered world imposes new—though to be hoped less strenuous—demands upon this industry, the energy, resourcefulness and cooperation which have distinguished it in these war years may be accorded the opportunity to continue a great job of production and to achieve an equally notable contribution to a constructive and prosperous era of peace.

Mechanization Trends Gaining In Metal and Non-Metallic Mining

Impact of war and plans for post-war mining combine to influence metal and non-metallic mine operators into more serious study and intelligent application of mechanized mining equipment similarly used in the coal mining industry.



By DR. L. E. YOUNG
Consulting Engineer

THERE HAS BEEN much said about developing new devices, new machines, new methods, and new processes for industry. However, there is a great deal that can be done in applying in one industry the devices and the practices that have proved commercially successful in another. In the last few years great strides have been made in coal mining by the introduction of mechanical devices underground, and in training men to use power tools in many new ways. This mechanization program has had among its objectives the elimination of drudgery at the working face and also an increase in the daily output from each working place. The most striking feature of this program has been in the application of power machinery in loading materials into cars or other transportation facilities. In most coal mines there is no opportunity to load the coal into mine cars by gravity. Some of the machinery and methods developed for flat coal beds have already been applied in flat deposits of non-metals and also in a few metal mines. It is suggested that coal mining machinery and methods may have even wider application in metal and non-metallic mining.

Track-mounted mechanical loaders, by the Eimco Corporation, Gardner-Denver Company, Sullivan Machinery Company and Myers-Whaley Company and Ingersoll-Rand and Sullivan scrapers for mucking and loading have greatly increased efficiency in metal mining operations during the last decade.

In connection with the improvement in the placing of material in cars, there has come another revolutionary movement in coal mining which has been necessary to take full advantage of rapid mechanical loading. Obviously, there is not much advantage to be gained in reducing loading time if it is not accompanied by corresponding savings in transportation from the working face. In some instances this has been achieved by the use of larger cars, by the use of rubber-tired trucks or shuttle-cars (thereby eliminating track at the face), by the use of conveyors, or by the use of scrapers (for short hauls).

In a thoughtful analysis of the problems involved in loading and moving a pile of muck or ore in a drift, room, or flat stope, the following objectives are usually evident:

1. Securing in one working face as large a volume as possible of material—

(a) Of size suitable for loading and transporting without delays incident to handling large pieces or boulders;

(b) With the face reasonably free of water and safe for the workmen and equipment without the excessive use of timber or other supports; and

(c) With the floor or bottom reasonably smooth, hard, and free from sudden changes in grade.

2. Providing a mechanism or combination of mechanisms that will place the material in or on the transportation equipment and deliver it continuously, if possible, to the main haulage facilities. The mechanism at the working face—

(a) May be mounted on slides, wheels, or caterpillars, or may be a

A Jeffrey L-400 loading machine which has been in service about 2½ years on 42-in track. It is loading potash into 5-ton mine cars

scraper dragged to and from the face by ropes;

(b) May employ the scraper, dipper, shovel, duckbill, or gathering-arm principle; and

(c) May deliver the material to a bin or mill-hole, to cars on wheels, to cars on tires, to a conveyor (chain, belt, or shaking), or to a large scraper or slusher.

The foregoing outline suggests the variety of methods and combination of methods and equipment possible, but in all of them there should be a recognition of the vital importance of continuity of loading and haulage and the elimination, as much as possible, of any operation that restricts continuity of work while the round or cut is being loaded and hauled away.

Obviously, large tonnage machines and equipment have no place in an operation where mass production is not an objective or is not practical. Where multiple shifting is practiced, by the use of such loading devices it may be possible to improve the output or footage of advance, if proper ventilation is supplied.

Among the equipment, developed in coal mining, that has been applied successfully in metal and non-metal mines, the following are notable:

1. Shaking conveyors, with and without duckbill.

2. Large capacity electric-powered track-loading machines of the Goodman and Jeffrey type.

3. Caterpillar-mounted loading machines of the Joy type.

4. Rubber-tired shuttle cars, powered by storage batteries, by electric cables, or by cable and double trolley.

In certain non-metal mines diesel-powered rubber-tired trucks have been used efficiently to haul from large-capacity loading machines.

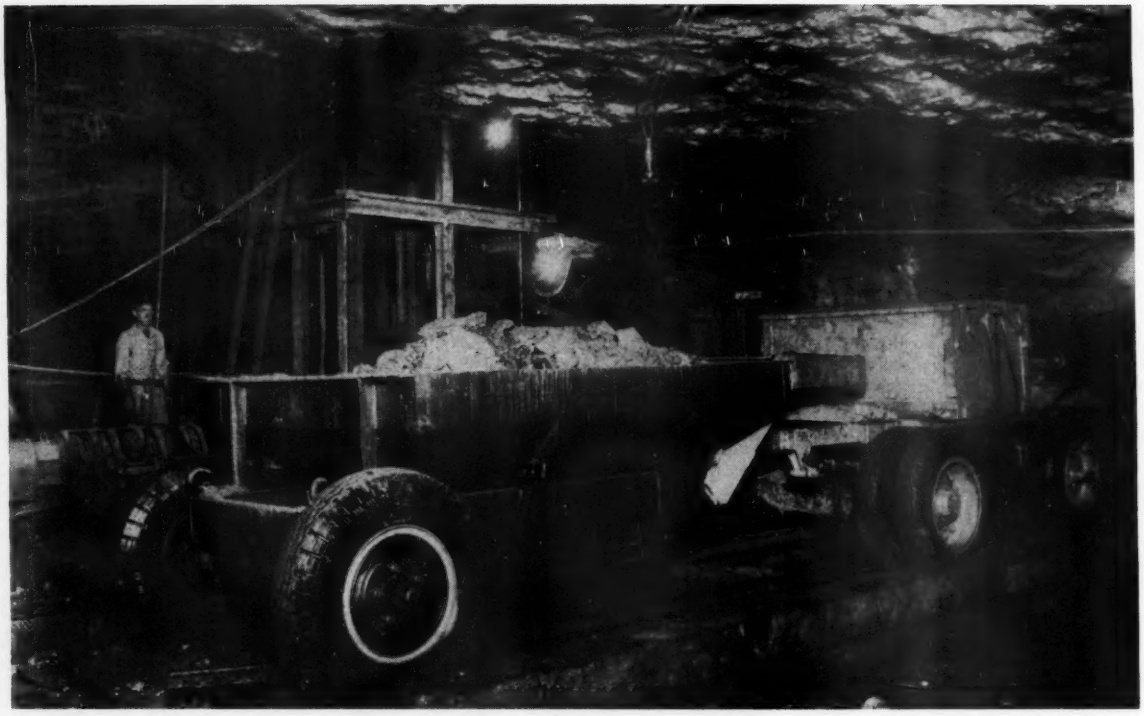
The *shaking conveyor* has found a place in copper, iron, salt, gypsum, borax, and potash mines as a transportation unit for handling ore and also for handling waste. The technical literature has contained accounts of the successful use of this equipment at Ray, Ariz. (*Mining Congress Journal*, April, 1940, p. 62), in several other large copper mines, on the Mesabi Iron Range, and elsewhere. In some places the duckbill has been very efficient in loading material onto the shaking conveyor, but it has not found as general use in metal mining as in coal mining.

On the Mesabi Range shaking conveyors are being used successfully to transport iron ore from scrapers which are operated on slices in sublevel mining. In a particular installation the orebody is 10 to 15 ft. in thickness and dips up to 20 deg. The roof or back requires heavy timber. A drift is usually driven by means of a 60-in. scraper to the full height of the orebody and about 10 ft. wide. When the drift has been driven to a determined distance, cross-cuts are driven on 110-ft. centers at right angles to the main drift. Cross-cuts are driven to the ore boundary and after the area has been thus blocked out, slicing begins. Slices are advanced at right angles to the cross-cuts and parallel to the drift. The slices are substantially the same width as the cross-cuts and are 50 ft. long. After each slice is completed it is caved and the next slice begun at the cross-cut. This retreat is carried back to the pillar determined upon, which is left to protect the drift.

A Joy 11-BU loader at work in an Ohio limestone mine. This machine loads over 700 tons per shift

After the cross-cut has been extended to the ore boundary, a shaker drive is installed and the pan line is extended to the slices to be mined first. A 30 hp. double-drum electric tugger is mounted on the loading hopper which is placed over the conveyor pan line, so that loading can be carried on alternately in the slices on either side of the cross-cut. A shaking conveyor is installed in each cross-cut and the ore from a number of shaking conveyors is gathered by a belt conveyor of suitable capacity and delivered to the loading pocket or bin.

In a borax mine in the Southwest a shaking conveyor is being used to transport ore from a scraper that hauls ore from one advancing drift and two cross-cuts. The scraper hauls the ore not to exceed 80 ft. and the conveyor transports it the remainder of the distance to a mill-hole, at times as much as 300 ft. By this combination the scraper may be used much more effectively, as its hourly capacity is reduced greatly when it operates over a distance of more than 70 ft. The shaking conveyor can be extended easily and will handle 100 tons per hour for distances up to 300 ft. When longer hauls are neces-



A drop-bottom shuttle car over an ore pocket

sary conveyors may be set up in tandem.

When scraper hoists are mounted on caterpillars and moved about in large stopes in flat beds it is practical to install shaking conveyors to transport the ore from the scraper to cars, etc., on side tracks.

The shaking conveyor has also been used extensively and successfully for handling waste from shafts or millholes to stopes that are to be filled. By means of swivels and angle-troughs, the conveyor line may be made to follow the course of the drift.

Track-types of loading machines of large capacity have proven efficient in potash, salt, and gypsum mines, as well as in coal mines. These loaders have a capacity of 6 tons a minute and will clean up a place 27 ft. wide. When these machines are serviced with mine cars or track-shuttle-cars of large capacity, and the time lost in car changing is small, they will load out a face of ore at a very rapid rate. These machines are adapted to loading anywhere that a track of suitable radius is laid, including entries, rooms, and pillars. They are equipped with a trolley pole and electric cable with reel, and can be moved quickly from place to place under their own power.

Caterpillar-mounted loading machines have been installed in limestone, gypsum, potash, salt, and zinc mines, loading both into standard mine cars and rubber-tired shuttle cars. The tonnage loaded per shift varies with the size and hardness of material, tonnage available at each face, size of mine car or truck, and facilities for quick car change. Machines of several sizes are available and have a loading capacity of 5 to 8 tons per minute.

Both the track-mounted and caterpillar machines of high capacity are

A Goodman shaking conveyor transporting hematite ore from a scraper into a chute. Similar conveyors are also used in western copper mines

well-built machines capable of loading from 500 to 1,000 tons per 7-hour working shift.

Rubber-tired shuttle cars may be operated by storage batteries, electric cable and reel, or double trolley (*Mining Congress Journal*, November, 1941). When the cable-reel type is used it is usually equipped with at least 500 ft. of cable. The cars are being used successfully in limestone, salt, potash, gypsum, and zinc mines and are being considered by several iron and copper companies for handling ore and waste both where large tonnages are involved and where long hauls are necessary.

While the trolley type of car was not planned for excessively long hauls, it is being used in one mine to make round trips of as much as 4,800 ft. In this particular case four shuttle cars are used to haul from one loading machine in order to avoid excessive waits during the car change.

There are two general types of rubber-tired cars, (1) tractor type with trailer drop-bottom car and (2) self-contained 4-wheel unit with a conveyor on the bottom for loading and unloading.

The shuttle cars may be used to (a) haul ore to mill-holes and winzes; (b) haul ore and load directly into mine cars (when there is a suitable ramp or when the discharge end of the shuttle car is sufficiently high to load into the mine car); (c) haul ore and unload onto a transfer elevator which discharges into a trip of mine cars; (d) haul ore and unload directly onto a large belt conveyor; and (e) haul waste and discharge, as in any of the foregoing conditions, or fill worked-out areas of the mine.

Recently in the operation of a caterpillar-mounted loader, serviced by two 7-ton shuttle cars, the following data were recorded in a large potash mine:

1. Time required to load three consecutive shuttle cars, 50 to 60 seconds each.

2. Time required to unload shuttle car at elevator, 60 seconds (including 4 seconds required to move trip of mine cars under elevator, mine cars having a capacity of 5.5 tons).

3. Total time required to load 85 mine cars (467.5 tons), excluding delays not incident to loading and local transportation, 205 minutes. (This included moving loading machine and cleaning up three working faces.)

4. Estimated tonnage for full 7-hour working shift at the foregoing rate, 957.6 tons.

It is estimated that if sideboards had been used on the shuttle cars, thereby increasing the capacity of the shuttle car to 8 tons, the over-all capacity of the loading and shuttle-car unit would have been about 1,000 tons in seven hours.

The average distance the ore was hauled in the shuttle car was 200 ft. A third shuttle car would be required to maintain this rate of production, if there were any substantial increase in the distance the ore was hauled.

Trends Point to Greater Mechanization After the War

Undoubtedly there will be many new installations and applications of shaking conveyors, mobile loading machines, and shuttle cars of the types and designs now on the market. Probably if sufficient demand develops new equipment will be designed to meet the specific needs of each mining field. At the present time there is no opportunity to make substantial improvements of equipment or to secure changes in design. After the war a more careful study of some of the problems of mechanical loading will surely be made by the progressive manufacturers.

Among the items that probably will receive attention are the following:

1. The development of a large-capacity shuttle car suitable for the underground haulage of heavier loads than are hauled at present. The trend is indicated by the building recently of a bottom-dump trailer having a capacity of 9 cu. yd. and capable of carrying a pay load of 14 tons. If such a car for underground use is of the cable-reel trolley type it should travel about 6 miles per hour when operating by trolley and 4 miles per hour when using the cable.

2. Rubber-tired shuttle cars that may be hauled in trains. Such trains might be hauled by permissible diesel locomotives, or electric trolley, or combination trolley - storage - battery units.

3. Rubber-tired shuttle cars suitable for use in driving the drifts for block-caving, etc. (*Engineering and Mining Journal*, March, 1940, p. 33).

4. Loading machines of the continuous loading type, designed specifically for handling heavy materials and possibly with a narrower head than the large-capacity machines now in service which were designed for coal loading. Probably such machines will soon be available mounted on rubber tires.

5. Loading machines of smaller size designed to load ore onto conveyors, either in entries, rooms, or on long faces.

Loading machines are being built for bench loading in coal mines, and this makes it possible to shoot and load portions of a face separately. While at present certain loading machines will load part of a pile of ore or coal and leave the remainder to be loaded separately, the effectiveness of this type of so-called "selective mining" could be improved if the loading machine were built specially for this type of work. By the intelligent development of this idea it should be possible to improve the grade of ore from sections of mines where the face is part waste and part ore.

Some of the foregoing suggestions may seem revolutionary to many engineers and operating officials who are not acquainted intimately with the current developments. It should be recognized that the manufacturers who have made possible the rapid mechanization of the coal industry are prepared to cooperate with the metal mining industry in applying proven coal-mine equipment to the metal mines, or modifying it if necessary. If substantial changes are necessary, they will be willing to design and develop new types of machines that may be better suited to metal-mining conditions.

Storage battery tractor and drop-bottom shuttle car in a zinc mine. Battery cars of this type are also now being employed in salt mines

1942—A Hectic Year For Gold Mining

Diversion of manpower to highly paid war jobs and lack of priorities on equipment caused a curtailment which was speeded by the historic closing order in October.

By HERBERT A. SAWIN
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Yuba Manufacturing Co.

TWO DATES stand out in the history of gold in America. One, 1849, marks the beginning of a new era, the start of a migration which built the West and put the whole country on a sound financial basis. Many critical periods were weathered and security for the nation was built on a golden foundation dug from the mines of western states. The other date, 1942, to many people, marks the end of that important period of western gold mining; a basic industry developed by free enterprise and courageous effort came to a standstill. Gold was not won easily except by a very few; it represented hardships, self-denial and the investment of good money by those pioneers who found and made the mines and their successors who developed them.

People were denied their rights to mine gold for the first time in our history, by Government action in October, 1942. Here was something new. Who, in mining, ever thought such a day would come? Economists had long discussed the possibility of operating the financial structure of a nation without gold. To starry-eyed dreamers it looked practicable on paper, but they always under-valued one historical fact, the ordinary man's regard and trust in a piece of gold. The "have-not" nations of history have tried varieties of such a system, but without lasting success. Bad money of any kind, forced upon a people, always has driven good money to cover. From the date of its first coinage, gold has been "good money."

Gold mines felt the pressure in the application of priorities soon after Pearl Harbor. No responsible member of the industry objected to using critical material for badly needed defense projects. As the war became a reality, more and more materials were needed for our armament program. The reasons for diverting essential materials were obvious and mining men, of all men, are realists.

Men were needed for defense plants and gold miners left in droves to secure better paying jobs. The draft was felt immediately in 1941 and made a heavy drain on skilled and unskilled mining men in 1942. Improved methods were introduced to keep up production and with some success. Increased wages for gold miners could not be high enough to meet shipyard competition for, as always, the finished product, gold, is sold at a fixed price which narrowly limits the margin within which wages can be adjusted. Mines struggled through 1941 and 1942 under the difficulties always attendant upon gold production when other commodity values were rising.

Results of Closing Not According to Plan

On October 8, 1942, came the blow. Economists in political positions found themselves with what seemed to be the answer to their prayers; a reason to close down gold mining. They believed that labor in one mine would work in another; it was all so simple. At least it looked simple on paper, and in the minds of theorists it should be a workable proposition. Practical gold miners or many other men with business and production experience could have readily pointed out the "bugs" had they been consulted. "Put the gold miners in the copper mines and increase production," said the theorist. "Sounds good, we have all the gold we need anyway," came the answer. History was forgotten and the closing order was issued. Insufficient thought apparently was given to the number of men who might be available or whether they might be physically fit to make the radical change; little thought given to the effects of a year or more of high wages in other industries or of the draft. Results, however, were not as expected by the planners. The number of men available and willing to change was pitifully small. An error had been made and realized, but by then, the gold mines were closed except for a few whose by-products warranted a P-56 rating and continued operation for those by-products.

This article is not intended as a technical paper or a report setting forth production figures, tonnages and similar data to be found in annual summaries or reports. It is based on impressions and thoughts expressed by many gold mining men. A few general comments concerning gold production in the United States and Alaska are of interest, however. It appears that total production of gold in this country for 1942 is 25 percent under 1941. In the western states, including California, production was probably off one-third. Mines producing about 75 percent of the nation's gold in 1941 were closed down by the end of 1942. In California, mines producing about 90 percent of that state's gold were shut down and idle by that time. The closing order had a serious effect on whole communities. The miners suddenly lost their jobs, leaving no money for the grocer or landlord and small shops and foundries serving the gold mines had no orders. The War Manpower Commission attempted to freeze gold miners in their jobs and men without jobs were directed to get releases through the U. S. Employment Service. It was an attempt to secure more workers for war industries, but came too late to accomplish the results expected by Government officials. The supervisor for the U. S. Employment Service in the Sacramento area, California, was reported to have expressed the opinion in October that machinists in the employ of the dredge operators would be needed for war industries. This was probably true but the number of such men were small to begin with. Many workers in the dredging industry had already gone and those remaining were old employes with long established homes and families. They could not, or would not leave for already overcrowded war-job areas. To help the situation some dredge operators undertook war work in their shops even at prices which brought red ink to the ledgers.

October, 1942, is truly a memorable date in gold mining, a dark period, but fortunately not a permanent state of affairs. Gold miners made the best of a bad situation and hoped for reviews of their cases and relief from

the unreasonable order—L-208—as mines must be kept unwatered and equipment maintained for eventual use. Pay rolls must be high enough to feed those left in communities dependent on gold mining. Such relief was not withheld; an action to the credit of those administering the shut down order and other associated rulings.

Some gold mines producing by-products such as copper, zinc, tungsten and other important metals were permitted to reopen and smelting companies were helpful in producing evidence of the need for shipments from certain gold mines whose concentrates provided fluxes needed in smelting operations. Late in December a few dredges were authorized to operate under a six-months permit providing that no essential material was purchased and no manpower used which could be of service in a war industry. Some hard-rock mines, particularly in the Black Hills and in Colorado are operating under similar limited provision.

Public opinion in gold mining areas was severely critical. Perhaps their political opinions had something to do with modifying the drastic measures which forced idleness upon a large section of people accustomed to freedom of thought and action. They, above all citizens, wagged their heads and said, "I told you so," when news reports came from North Africa briefly stating that gold coins were used to aid the Allied invasion.

While discussing gold mining with practical and successful operators, some expressed an interest in the stock market reaction to the gold shut-down order. A question often asked was who bought the gold shares at half price or thereabouts? Who sold short, forcing down gold stock prices? Gold, a valuable commodity in any land, is owned wholly in our country by the Government and thereby indirectly by all citizens. Was there a planned or perhaps an accidental relationship between the gold shut-down and gold share movements just afterward? Who profited thereby? These are questions in the minds of western gold miners and the answers, if they become revealed in the future, will be of considerable interest.

Summarizing briefly the 1942 gold mining activity, it should be noted that small placer operations in the West, particularly those properties mined by draglines and separate washing plants, first felt the shortage of materials and suspended operations. Since dragline equipment was in great demand a ready market was found. Some of these operators found a good excuse to get out of business, salvaging some of their investment. Others, who were working in a narrow margin of profit, found it impossible to compete with high wages elsewhere and suspended. Later in 1942, larger dragline operators and some dredges felt the material shortages and wage problems to the extent that their operations approached an unprofitable condition.

Some dredges, when the closing order came, had already been shut down. The prospects for reopening did not seem favorable in view of high operating costs and higher taxes. It seemed to be good business to await more favorable times and to leave the gold in the ground for future digging. At least one deep California mine was reported closed down because of material and labor shortages.

A few hard-rock miners continued operating because of their P-56 ratings and the production of essential by-products. As men were drawn away by the draft and attractive wages in other industries, operations supplemental to the actual production of ore, such as development work, etc., were curtailed and in some cases, abandoned. This had the effect of maintaining income, but at the expense of future production and earnings.

Operating Permits Granted for a Six-Month Period

Most mining men feel that authorities in Washington have been cooperative and are understanding of the gold miners' problems. Several mines, which closed down, are now operating under six-months permits with the hope that these permits will be extended as they expire. Other mines have made application for permits to reopen, using supplies and material on hand or drawing on spare parts from shut-down equipment. All these plans include only the employment of men who, because of age or other good reasons, cannot be made available to war industries.

Some gold miners have gone into other mining ventures, including quicksilver and scheelite. At least two dredge operators will produce scheelite in their future operations. One gold dredge in Montana was not closed down by the order because of its sapphire production, originally included as a by-product of gold, but now mined as an essential material. Another dredge in Alaska, since starting a few years ago, has been an important producer of platinum with gold as a by-product. It was not shut down. One large Black Hills mine has a six-months permit to operate, being allowed to draw broken material from stopes. One large custom mill in Colorado has been permitted to operate on a reduced basis for the treatment of zinc ore.

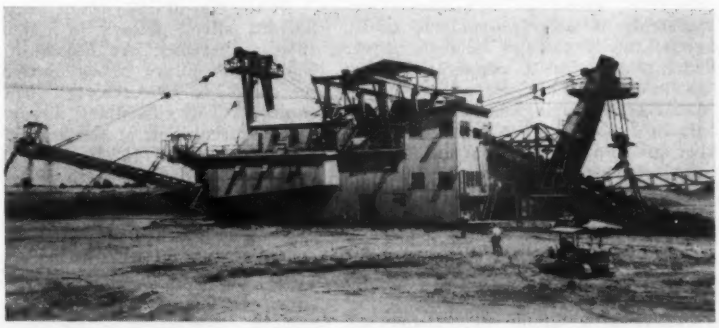
While the future for gold mining in 1943 is not particularly bright, the gold miner's position is somewhat improved. Most operators hope to maintain their equipment and to recover enough gold to pay fixed charges. Limited operations will permit the employment of those men who cannot leave the immediate vicinity of their job and even these limited pay rolls will help gold mining communities to be of greater value to the war effort.

Gold miners, being optimists, look to the future hopefully. Gold production and gold, or gold mine ownership, are close to the basic commerce of the world and future inhabitants of this globe will have their way of life shaped to a great degree by world commerce. Continually increased indebtedness and its relationship to a readily acceptable commodity like gold will affect everyone.

Few men can predict or visualize with any certainty how far the load of national and international indebtedness will eventually lower our living standards. Gold mining men all seem to be certain, however, that gold will increase in value intrinsically at least, and probably be raised in dollar and other currency values. A reasonable relationship between national gold hoards and national indebtedness could be maintained.

Axis armies immediately seized gold stores wherever found. Regardless of Axis statements that business can function as usual without gold, the leaders proved by their actions that they do not believe all that they preach. Since it is unthinkable that the Axis can or will win, it is sound judgment to foresee for gold, a place in the world scheme of affairs based on a higher commodity value than at present. How much higher? Who knows?

Gold dredges also recover platinum, sapphires and tin



Silver at Work in the War Program

Tremendous demand for this metal and its alloys stems from the needs of vital war industries. Estimated consumption for such purposes alone in 1942 totaled 90,000,000 oz.; in 1943, 175,000,000 to 200,000,000 oz. will be needed.

By A SPECIAL CORRESPONDENT

THE POSITION OF SILVER at the present is unique. From the time money has been used in the form of coins silver has been a standard of values and a base in our monetary system.

Today silver has assumed new responsibilities and is proving indispensable to American industry. This trend commanded attention in 1940 and increased steadily during 1941, when it was discovered how efficiently silver could fill the gap created by the shortage of other metals. During 1941, prior to Pearl Harbor, 10,000,000 oz. of silver were consumed by American industries engaged in defense work. As our defense program expanded, the use of silver increased. Since we entered the war a terrific demand for this precious metal has developed, 90,000,000 oz. being consumed in 1942. That is aside from the 45,000,000 oz. consumed in 1942 in the manufacture of silverware, jewelry, and other civilian articles. It is authoritatively estimated that from 175 to 200 million oz. of silver will be needed during 1943 for war purposes alone. However, the arts in the United States will consume less than 10,000,000 oz. this year.

In some war uses, nothing else will do as a substitute for other metals. Silver is a commodity as inseparable from our present civilization as are iron, aluminum, tin, zinc, lead and copper. Silver and silver alloys are the most desirable and durable high-temperature soldering and brazing materials used. It is employed extensively in ships, airplanes, tanks, guns, torpedoes and bombs. Silver wire is superior to copper wire, and no other metal has proved as efficient as silver in bearings used in tank and aircraft motors. The ductility of silver gives a smooth-wearing surface, and silver's high-heat conductivity keeps these bearings cool with a minimum of lubrication. Silver is being used advantageously in war industries today where high-electric and thermal conductivity, tensile strength and ductility are a prime requisite.

There is available 47,000 tons of bullion silver which has been drafted for nonconsumptive uses in war plants. More than 22,000 tons of this Treasury silver has already been shipped from the vaults at West Point.

On July 29, 1942, the War Production Board issued a directive reserving all imported silver for use in war industries. During the past two months the Metals Reserve Company has been buying the surplus imported silver that has come on the market and now has in excess of 5,000,000 oz. on hand for war industrial use. This amount will soon be increased to 10,000,000 oz. That is made possible because the amount used in the arts has been drastically reduced, as the manufacturers of silverware and jewelry have been steadily converting their plants to war production.

Mines Produced Less Silver in 1942

Silver production of the United States for the calendar year 1942 was 54,123,792 oz. This is 21 percent less than in 1941.

Silver subsidiary coinage in the United States increased from $76,120,483 in 1941, to $102,054,773 in 1942, an increase of 13.4 percent. In minting U. S. and foreign coins in 1942, our mints consumed a total of 85,000,000 oz. of silver bullion, or 31,000,000 oz. more than the total domestic production. In 1942, 73,952,734 oz. were consumed in United States coinage alone.

At the end of 1933 there were $29,337,523 silver dollars in circulation (33c per person). At the end of 1942, the silver dollars in circulation had increased to $76,279,641 (57c per capita). The subsidiary silver coinage in circulation at the end of 1933 was $271,645,516 ($2.15 per capita), whereas in 1942 subsidiary coinage circulation was $574,941,715 ($4.27 per capita). The total silver certificate circulation at the end of 1942 was $1,751,011,834 ($13.01 per capita), which was 88.7 percent of the total silver certificates outstanding, $1,972,869,472. Silver exported from the United States during 1942 was valued at approximately $2,010,000. This figure is composed almost entirely of the value of the foreign coins we shipped abroad, though we did export 1,500,000 oz. of bullion in addition to the coins. The silver imported into the United States for the year 1942 amounted to about 110,000,000 oz., the principal contributors being Mexico, Canada and Peru.

In 1934 the greatest silver buying program ever engaged in by a government was inaugurated. The Silver Purchase Act resulted in the acquisition by the United States Government from June, 1934, to December, 1942, of approximately 2,055,300,000 oz. of foreign silver and 500,600,000 oz. of domestically mined silver. United States industrial consumption during that period was 571,067,514 oz., and the world consumption of silver in coinage systems was 902,923,368 oz.

Several Governments Melt Down Silver Coins

It is difficult to account for all of the silver stocks held by governments throughout the world because of the practice resorted to by several governments in recent years of melting down and devaluing their silver coins, thereby reducing their fineness. This procedure enabled those countries to increase their coinage circulation without acquiring new silver. It also enabled them to use their surplus silver to meet demands in the various bullion markets where other countries were seeking silver for coinage and industrial use. The practice resorted to by governments of melting down their silver coins and dumping their surplus silver on the bullion markets, thereby depressing the world price, is regarded by many people as lending encouragement toward racketeering on the part of such governments, bullion brokers and industrialists.

It also had the effect of increasing the monetary value of the silver remaining in the coins. In short, these governments withdrew from the silver coins a part of their intrinsic value, thereby destroying the value of the coin as well as the confidence of the people. Their purpose was to destroy silver as money and to deal with it as they do the base metal, copper, when coined into money. Silver is a precious metal, as is gold, and its rightful place as a medium of exchange as well as domestic currency should be restored and protected.

On March 16, 1942, the Office of Price Administration issued a directive which placed a general ceiling on most of the commodities that enter into the economic life of this nation. Silver was included under this general ceiling. The foreign price of 35⅝ cents per oz. and the domestic price of 71.11 cents per oz. were then made rigid. The pegging of the price

of foreign silver at 35⅜ cents an oz. met with the enthusiastic approval of the silversmiths and jewelry manufacturers, as imported silver has been the source of supply for use in their industries.

But the growing demand for silver by war industries became so great that the War Production Board on July 29, 1942, issued an order which denied to these manufacturers the purchase of foreign silver, but permitted them to continue until October 1, 1942, to process the silver stocks then on hand. This period was later extended to November 15, 1942, since which date no foreign silver has been permitted to be consumed in the manufacture of these luxury goods. But these manufacturers can still buy domestically mined silver at 71.11 cents an oz. By the end of 1942 the Treasury had practically stopped buying newly-mined domestic silver. Slightly over 88 percent of the domestic production of 1942 was acquired by the Treasury, leaving the remainder for the civilian goods manufacturers.

Foreign Silver Price Increased to 45c. per oz.

In spite of the increased demand for silver in the United States, the price of domestically-mined silver has not increased since the Act of Congress of July 6, 1939, which established a net price of 71.11 cents an ounce. In reality the price of domestically-mined silver is $1.29 an ounce. The Treasury actually pays 71.11 cents for 55 percent of the ounce, the remaining 45 percent of the ounce being claimed by the Treasury as "free silver." Only the 55 percent portion is monetized; the rest is profit. However, the price of foreign silver was raised on September 1, 1942, from 35⅜ cents to 45 cents an ounce, chiefly because of the desire of the State Department to further the Good Neighbor Policy and to increase silver imports, as well as to extend financial aid to the Government of Mexico. As a result of this increase the Government of Mexico received 4½ cents of the 9⅝ cents per ounce differential. The melting point of the Mexican peso is 53.7 cents an ounce, which acts as a barrier against a rise beyond that point in the price of Mexican bullion silver.

On September 14, 1942, Senator Green of Rhode Island introduced a bill in the Senate, presumably intended to make Treasury silver available for use in war industries. This bill, in its original form authorized the Secretary of the Treasury to sell, lease, or otherwise dispose, of Treasury silver to war industries, to foreign governments whose defense is of vital importance to the defense of the United States, to any person, corporation, partnership, or government department, for use in the manufacture of civilian goods not inconsistent with the war effort, and to silverware and jewelry manufacturers while their plants are being converted to war production. It also stated that the average price of all silver sold under this Act should not be less than 50 cents per fine troy ounce, and that at all times the ownership and the possession of an amount of silver of a monetary value equal to the face amount of all outstanding silver certificates heretofore or hereafter issued by the Secretary of the Treasury shall be maintained by the Treasury.

On December 7, 1942, Senator McCarran submitted an amendment by way of a substitute for Senator Green's bill (S. 2768). The aims of this proposal paralleled that of the Green bill in so far as releasing Treasury silver for war industries goes, but the methods employed were fair both to the producer and the consumer. It provided that the price for all silver sold under this act should not bring less than 71.11 cents per fine troy ounce, and carried the same stipulation with respect to the protection of the outstanding silver certificates as did the Green bill. It further provided that no silver shall be sold until all current supplies of imported and domestically-mined silver shall have become reduced to an immediately available aggregate stock of 20 million ounces or less, and that any silver leased under this Act shall be returned within one year after the termination of the war.

During 1942 unwarranted propaganda concerning silver has circulated through the mail and was published in several of the outstanding magazines and newspapers in the East. None of these articles had any foundation in fact whatsoever. The twelve Senators that represent the six leading silver-producing states of the West were accused of refusing to permit the release of Treasury silver for use in industries engaged in war production.

New Organization Seeks to Depress Silver Price

Investigation has disclosed the fact that within the past four months a new organization has been formed in New York City, under the name of the Silver Users' Emergency Committee. It is made up of jewelers, silversmiths, and other industrial consumers of silver. This organization is behind the movement to depress the price of silver, and to establish a precedent of making Treasury silver a stockpile for their industrial requirements at 50 cents an ounce. They would like to establish a "world price" for silver in the United States that would conform to the "official" price of approximately 50 cents in London and India.

The people of India lack confidence in the pound sterling. The exchange value of the rupee has declined since civil strife developed in India last August, but the price of silver in Bombay rose from 62 cents to 93 cents an ounce, which high price was reached in November. In spite of the fact that the melting point of the old rupee is approximately 87 cents an ounce, the Indian authorities show no signs of apprehension with regard to the dehoarding of the old rupee silver coins of 11/12ths fineness, irrespective of their loss of legal tender status beginning in May, 1943. In other words, the Indians prefer the old high-silver content rupee coins to the new low-silver content coins regardless of the loss of legal tender status of the higher silver content rupees.

Post-War Era Offers Extended Uses for Silver

The future holds many and varied opportunities for silver. Silver in industrial uses will assume a position of paramount importance in the post-war period. All of the tests to which it has been subjected have proven its superior qualities and the versatility of the metal.

Governments and industries throughout the world will be competing in the open market for silver soon after the cessation of hostilities. Post-war readjustments will demand a more extensive use of both gold and silver than has ever occurred in the history of the world. Silver will be by far the more useful of the two precious metals because of its demand for monetary circulation and industrial utilization. It will be used to surplant subsidiary paper money of extremely doubtful value. Silver coinage will continue to increase during 1943. As our troops are sent abroad in greater numbers, they will require greater amounts of small denominational coins. Silver and gold will be used concurrently in rehabilitating and stabilizing the currency systems of the impoverished nations and will act as a tonic in revivifying their commerce and restoring their international status. Gold will probably be confined largely to the settlement of international balances and to the function of backing for indirectly redeemable paper money, while silver will circulate both as coin and be held in bullion form for the redemption 100 percent of paper money backed by silver.

Those economists who insist on managed currencies as a basis for conducting world trade are doomed to disappointment and failure. No managed currency system has ever succeeded. The people of the world will demand both gold and silver and their appropriate utilization, for which no satisfactory substitute has been found since time immemorial.

Phosphate and Potash War Need Supplied by Domestic Industry

Improvements in mining and recovery practices of these important non-metallics will place this industry in a good position after the war.

By STAFF MEMBERS OF THE
INTERNATIONAL MINERALS & CHEMICAL CORP.
Chicago, Ill.

JAMES A. BARR
Chief Engineer

INCREASED farm production and "lease-lend" requirements indicate that the domestic phosphate industry will operate at capacity during 1943, with a likelihood of an increase above the output for 1942. As in 1942, Florida will continue to be the leading producer, followed by Tennessee and the Western States. The war has virtually shut off the large African production which was normally sent to European countries. Export is now limited only to "lease-lend" allocation which does not equal prewar tonnages.

Ocean Island and Naru, two islands northeast of Australia, and on the equator, were cut off early in the war, therefore, these two important producers are not now a factor in the market. Production from the large Kola Peninsula deposits in the Soviet Union did not appear in foreign markets during 1942.

After the war there will be a tremendous demand for phosphates from impoverished farms, but how soon it will be satisfied will depend on the conditions of the mines, and their ability to get into production again, and how soon honor in international trade is restored sufficiently to permit the normal flow of commerce.

Mining methods remain about the same; the overburden is removed by electric dragline shovels mounting 140 to 160 ft. booms with buckets ranging in capacity from 6 to 10 cu. yds. The matrix is mined by hydraulic methods in combination with draglines.

Florida Provided the Largest Output in 1942

The Florida pebble field, centered in Polk County, furnishes by far the greatest percentage of the production in this country. The deposits occur in blanket formation under a sand-clay overburden varying from 15 to 40 ft. thick.

The phosphate "matrix" is a physical mixture of sand and clay, with phosphate pebbles varying in size from 1 in. to 80 mesh. The composition of this mixture in the remaining deposits to be exploited appears to be changing toward a much larger proportion of the finer sizes, i. e., 1/16 in. down to 200 mesh, with the result that the so-called coarse pebble production in the higher grades has of necessity rapidly declined.

Washing consists principally of scrubbing, as in log washers. Mechanical screening supplies a product of about 14 mesh and hydraulic classification is used in the finer sizes, for the separation of clay and silica-sand from the phosphate. The rejects or tailing from the washing contains, in most cases, a valuable content of phosphate and is recovered in order of size by agglomerative tabling and froth flotation, and in one instance, electrostatic separation.

The phosphate concentrates and pebble is dried by direct heat in oil-fired rotary dryers before shipment to the trade. Some wet phosphate is shipped direct to nearby phosphoric acid plants.

In the "hard rock" fields around Ocala, Fla., the phosphate occurs in similar formation but as lump form instead of pebble. Here also, mechanical mining methods are used, followed by the usual washing for separation of the phosphate from clay and silica sand.

Some Tennessee Deposits May Require Underground Mining

Tennessee brown phosphates are all mined by open pit methods, though some underground operations are indicated in the future where the deposits lie under heavy overburden, i. e., up to 200 ft. The overburden in the district is mostly clay soil with more or less flint occurring in loose formation. Very little mining is now done by hand methods. It is done, however, to clean up around lime boulders so that the matrix can be more easily loaded by the dragline.

The Tennessee Valley Authority continued to improve its operations, which started last year near Columbia, by introducing hydraulic transportation from the mine and washer installation to the sintering plant several miles distant. The installation is now running quite smoothly over a terrain where rail or truck transportation would be difficult or costly.

There has been a tendency to increase the use of truck haulage from mine to washing plant as the more centralized deposits are mined out and distant and scattered areas are brought into production.

Practically all operations were confined to the Mt. Pleasant, Columbia and Wales areas with only some very limited activities in Centerville, and virtually all the tonnage shipped was brown phosphate.

Caterpillar mounted draglines are now used for both stripping and mining operations. The obselete steam machines are being replaced by diesel or gasoline-driven units as rapidly as possible.

In the washing of brown phosphate, little change occurred in 1942. The Tennessee Valley Authority constructed a very compact unit following their policy of trying out new ideas and making their research-pilot plant operations a proving ground for the industry as a whole.

The use of differential grinding con-

tinues to grow. A ball mill unit was installed at the Blue Grass plant of International Minerals & Chemical Corporation, to handle the following conditions;—large flint and limestone pebble occur intimately in the strata with brown phosphate and in the washing process are concentrated along with brown phosphate during elutriation and water classification to separate the clay-like waste grade fractions. Gravity differences and size, rule out the usual beneficiation methods, but toughness, hardness and high difference in grindability make differential grinding possible.

The usual practice is to send a relatively coarse washed product, say plus ⅛ in. or 3/16 in. to a short ball mill preferably with a partial ball load, operating in closed circuit with suitable screens. The limestone and flint build up in the circulating load so that at necessary intervals one or more of these coarse products must be discharged to waste.

The loss in sliming due to grinding and the presence of phosphate lumps in the discharged product is found to stay within commercial limits in view of the benefits obtained from grade increase. No noteworthy changes were made in general washing or froth flotation practice during the year, and drying continued along the usual established lines.

A large part of the Tennessee output is shipped to electric furnaces where elemental phosphorous is produced and allocated by the War Production Board for use in the war effort and essential chemical lines.

Phosphoric acid continued to be produced by wet methods but all this output went directly into the manufacture of triple super phosphate needed in the domestic fertilization program and for "lend-lease."

The manufacture of heavy chemicals such as sodium phosphates from phosphoric acid produced by wet methods was discontinued in the Tennessee plants for the duration.

Large capacity trucks, draglines, large scrapers and bulldozers are used in moving the phosphate matrix at the Wales phosphate mine, Tennessee

Florida Phosphate Mining Experiences Some Noteworthy Changes

INTERESTING developments in 1942 phosphate mining begin with the increased use of draglines for mining of the matrix, followed by the use of hydraulic methods for transportation from the mine face to the central washing plant. The draglines used are the same type as previously described by Mr. Barr.

The apparent advantages lie in power saving by elevating the matrix out of the pit with the highly efficient electric hoisting action of the dragline as compared with hydraulic pumping at lowered efficiencies, which also requires handling of large quantities of water.

The matrix is then dumped by the dragline into a small excavated sump where it is washed down with low-pressure water and pumped to the washer. This results in a material saving of power since all hydraulic mining requires water pressures two to three times higher than the combination methods. There is a third saving, in that all equipment is kept out of the pit bottoms where mud and water make moving operations difficult and expensive.

E. T. CASLER
Division Engineer

It is now the policy of the War Production Board to allow new construction, only for replacement as required by exhaustion of a mine. This practically prevents any expansion of facilities. However, under the above restriction, and in one case prior to the order, there were several new projects completed during the year.

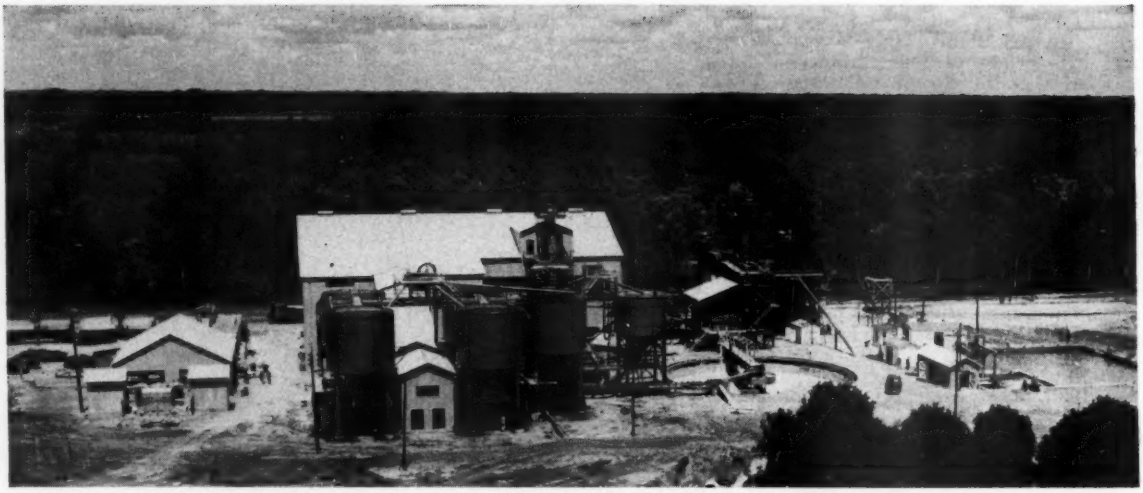
International Minerals & Chemical Corp. put into operation early in 1942 their "Peace Valley" mine and flotation plant which represented a very substantial increase in capacity over the previous units and is said to be one of the world's largest non-metallic flotation units.

Combination dragline and hydraulic mining methods are used at this unit. The washing plant is of the usual type, of all steel construction using log washers, mechanical screens, mechanical and also hydraulic classifiers. The washer rejects are deslimed in Dorr hydroseparators, then separated into a 16 to 35 mesh fraction for agglomerative tabling and 35 to 200 mesh by Fahrenwald hydraulic sizers for froth flotation.

Deister super-duty diagonal-deck tables turn out a finished product but the froth flotation section operates on the double float principle, i. e., the deslimed and dewatered feed is given a roughing float, using fatty acid as one of the reagents. The floated phosphate is again dewatered and given a final cleaning float to reject the silica sand as a froth by the use of an amine as one of the reagents. All the recovered products from the washer flotation section are elevated or pumped into steel bins for final drainage before shipping in railroad cars to the central dryer plant at Mulberry.

The American Cyanamid Company recently started a new operation at "Saddle Creek" which replaced their "Old Colony" mine and plant.

No new treatment methods were introduced during the year. The washer is the usual type as previously described, with the exception that special high speed scrubbing disintegrators are used extensively to break down "mud balls" and clay pellets. The other distinctive points in the flow sheet are the use of large storage or surge bins ahead of flotation and a large diameter Dorr hydroseparator thickener for recovery of the fine to 200 mesh or smaller. The flotation section uses the fatty acid



The company's new Peace Valley phosphate washer and flotation plant

float only, but it also separates the feed into coarse and fine fractions which are treated in separate sections.

The American Agricultural Chemical Company, started a flotation operation for the recovery of phosphate from a "debris" (tailing) dump. Swift and Company added an amine or sand float to the flow sheet of their plant near Fort Meade, which now operates on the double float principle.

One change in ownership was reported when International Minerals & Chemical Corporation disposed of their interest in Phosphate Recovery Corporation to Minerals Separation North American Corporation, now controlling owner.

The Tennessee Valley Authority has completed plans for an electric furnace plant for the production of elemental phosphorus in a Gulf location but to date the project has been held up.

Chemical Products

R. B. WITTENBERG
Manager, Chemical Division

PRODUCTION of defluorinated phosphate was considerably increased during the year because of heavy trade demands in cattle feeding and similar requirements. Phosphate rock and phosphate derivatives followed the general upward demand trend in 1942. There were, however, certain new or increased uses which while accelerated by the war were not caused by it.

One of the outstanding advances in phosphate products was the appearance on the market and the remarkable acceptance of defluorinated phosphate sold under the name of "Defluorophos"—a mineral ingredient for stock and poultry feeds. This material provides a source of phosphorus in stock feed replacing bone meal, which is not difficult to obtain. Defluorophos has the additional advantage of a constant and controllable P_2O_5 content, a controlled fluorine content below that of bone meal, and freedom from the possibility of bacteria contamination.

Elemental phosphorus has proved to be an ingredient in a most effective military incendiary and combat agent, and increasing quantities of phosphorus have been used.

Organic compounds of phosporus used mainly as plasticizers in plastics have had an exceptionally rapid growth, and this growth is expected to continue with the development of the plastic industry. The increasing demand for organo-phosphates has in turn stimulated the production of the phosphorus chlorides from which they are made.

There has been an incresing interest and demand for the calcium phosphates in the glass and ceramic industry as the phosphorus compounds have been found to be good opacifying agents.

Potash

THE MAJOR portion of our domestic potash production comes from the mines in the Permian Basin deposits east of Carlsbad, N. Mex., where from one to three commercial beds of potash occur at depths of 800 to 1,000 ft. Both the sulphate and chloride ores, i. e., Langheinite and Sylvinite, respectively, are found there but the former is now mined only by the International Minerals & Chemical Corporation.

Production has been upward for the last few years, in fact nearly doubled, especially in the Carlsbad area. There will be some increase this year but the rate will not be as sharp as that of previous years.

The smaller portion of potash production, both sulphate and chloride (muriate) comes from operations at Trona, Calif., where brine from Searles Lake is treated by evaporation and crystallization for the recovery of potash and other salts. Potash recovered from industrial wastes and similar sources is of minor importance in the over-all picture.

Unless conditions materially change, 1943 should see the peak in potash production, as previously mentioned, with any future expansion governed, as in the past by the growth of domestic farm demands. What will happen after the war depends on the foreign trade setup and the balancing of domestic capacities against substandard labor production in foreign countries and competitive imports.

There have been no radically new process developments during the past year, except the usual progressive improvements of existing methods; these will be described later along with brief outlines of general practice.

Coarse crushing of the potash ore is mostly done underground through single roll crushers. One company, however, uses a gyratory crusher on the surface. The fine crushing from 4 or 6 in. down to 8 mesh is done mostly in cone crushers and rolls; the latter in closed circuit with vibrating screens.

International Minerals & Chemical Corporation departed from the above practice and installed impact crushers, i. e., Jeffrey Flextooth crushers followed by swing hammer mills in stage crushing with intermediate and closed circuited screening. The results have been excellent with a minimum production of —200 mesh fines, low power consumption per ton and high capacity output per unit.

The separation of the sylvite from halite is effected by flotation in two plants and by solution and selective crystallization in one plant.

As in Florida phosphate practice, the type of flotation depends on the screen size of ore. For the range of minus 8 plus 28 mesh fraction, agglomerating tabling is used. The sylvite flows across the tables, while the salt is discharged at the tailing end. The finer fraction varying from 35 to 45 mesh is floated in flotation machines. The potash is floated in one plant while the salt is floated in another. Different reagents are of course employed, i. e., a fatty acid soap or an amine.

The International Minerals & Chemical Corporation produces potassium sulphate by a base exchange reaction between Langheinite and Sylvinite. The end liquors from this process are to be treated in a new plant where magnesium chloride will be produced by further evaporation and selective crystallization. The magnesium chloride in dried form will be shipped to a magnesium metal plant in Texas also operated by the company.

All the above potash salts are filtered and dried in gas fired direct heat rotary dryers or drying filters before shipment to the trade. Potassium sulphate is also manufactured at Trona by a base exchange process. The Potash Company of America also gets some production as a by-product from the manufacture of hydrochloric acid.

JAMES A. BARR.

Trend in Potash Mining Indicates Greater Use of Mechanized Equipment

DR. L. E. YOUNG
Consulting Engineer

WHILE no substantial changes have been made in the mining methods in the Carlsbad, N. Mex., Potash District, some progress has been made in cutting machine bits and drill bits, and in the handling and stowing underground of waste material encountered in driving entries and rooms in the ore-bearing horizons. There has also been increasing use of mobile loading machines and rubber-tired shuttle cars.

Cutting Machine Bits—The standard practice has been to use undercutting machines with a 9-ft. bar. Such machines are equipped with a 50-h.p. motor, and have a feed of about 6 in. per minute. Considering the hardness of the material in which the cut is made, it is not practical to increase the feed and the logical way to improve the daily work of a cutting machine is to improve the cutting bits. Due to the fact that sometimes considerable sulphate occurs in the sylvinite beds, the cutting may be too hard for the standard bit. In mining the sulphate beds it is necessary to cut at least a foot under the bed proper, as it is not possible to cut in the hard sulphate. Even when the undercut is made beneath the bed, there may be stringers or nodules of sulphate encountered. When hard material is struck it is necessary to change bits often and this involves considerable loss of time. By the use of a special steel bit, which may cost three times as much as the standard bit, it has been possible to eliminate much of the time previously lost in changing bits.

Drill Bits—The standard practice in drilling sylvinite ore has been to use a mounted electric drill, and no difficulty is found in drilling the ore except when nodules of sulphate minerals are met. In the sulphate bed, however, the minerals are much harder and it has been necessary to use a reciprocating air-drill with a "Mexican setup." This involved installing air and water lines, in addition to the electric power lines required for the cutting machines and loading machines.

With the "Mexican setup" it is not possible to bottom the holes as accurately as when a mounted drill is used. After considerable experimental work it has been found practical to use the same type of one-man electric post drill that is used in drilling sylvinite, providing a specially designed carboloy bit is used.

Rubber-Tired Shuttle Cars—The use of shuttle cars has been extended and is now the standard method of handling ore in rooms in two of the three mines in the district. One of the chief advantages of this type of equipment is that, with the prevailing room-and-pillar system of mining, it is possible to load waste material—such as salt rolls—into shuttle cars and unload it on the floor in nearby worked-out rooms.

Large preparation and storage plant for phosphate in Florida

Track type machine for loading potash

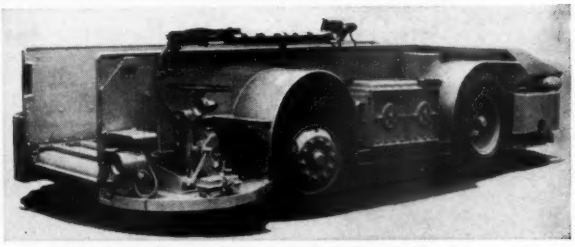
In certain instances, when storage space has not been available nearby, the waste material has been hauled as much as 2,000 ft. in shuttle cars.

When storage space is limited, the practice is to move the salt on the off-shift in shuttle cars and unload it onto the front end of a caterpillar-type loading machine which serves admirably as a stacking device in rooms 8 to 10 ft. high and 32 ft. wide. Both the storage battery and the cable-reel-and-trolley types of shuttle cars are being used successfully.

Mobile Loading Machines — Additional loading machines of two types have been installed during the year in the two mines in which mobile loading machines have been used previously. The track type of loading machine has been used extensively in entry driving where mine cars are used, while the caterpillar type has been used in both room and entry work with shuttle cars and also with standard mine cars. The output per loading machine and per man-hour of the loading and transportation crews has shown a great improvement.

Future Mining May Be a Modified Room and Pillar System

The introduction of rubber-tired shuttle cars has made possible a considerable improvement in the effective use of mine cars, mine haulage, and hoisting facilities because it is now possible to leave underground a larger proportion of the waste salt that may have to be handled in rooms and entries. It is anticipated that with the availability of salt as a filling material it may be possible to modify the standard room and pillar layout, and within a room panel or subpanel follow the ore body and leave salt in irregular pillars. This should make it possible to recover a larger percentage of the ore and move a smaller amount of waste material.



A Joy trolley type shuttle car now in use by the International Minerals and Chemical Corporation's potash mine in Carlsbad, N. Mex.

Markets and New Uses for Potash

POTASH and potash compounds have increased in production and use following the general trend. The domestic production of potash has been increased and has been able to meet all essential domestic demands.

In the field of potash chemicals, domestic production has been encouraged and increased to the point where the United States is now completely self-sustaining, and in fact has become an exporter of products formerly supplied to world markets almost exclusively by the Axis or Axis-dominated powers.

In 1942 the production of potassium chlorate was started in several new plants; and those well situated with respect to raw material, markets and power are expected to be able to remain in existence and operate profitably even in the face of postwar competition.

The production of potassium perchlorate has been undertaken in at least two new plants, and increased demand for this may make further expansion necessary. Increased production of potassium permanganate also occurred.

The production of caustic potash increased rapidly, and much of this increased output was absorbed in the soap industry. Because this industry was unable to obtain adequate quantities of vegetable oils and fats from the South Pacific area from which soft soaps are made, the soap industry turned to the increased use of caustic potash which permits the production of soft soaps from fats and oils obtainable domestically.

The demand for potassium carbonate increased rapidly, particularly for the manufacture of fluorescent lighting bulbs; and it is expected that this demand will continue to expand.

R. B. WITTENBERG.

Sulphur Mining Provides Sinews of War

Expansion of industrial activity increases demands over wide range from making artificial rubber to perfecting processes for recovering manganese from domestic ores.

By W. W. DUECKER
Texas Gulf Sulphur Company

THE SULPHUR INDUSTRY in 1942 made new records in production and in producer's stocks, and as an indication of the latent capacity of the industry, it should be noted that these records were made without putting any great strain on facilities. Shipments, however, declined somewhat as a result of restrictions in wartime shipping and completion or modification of consumer's and producer's stock-piling programs. The U. S. Bureau of Mines reports that the output of sulphur in the period January through October, 1942, was 18 per cent greater, mine shipments were about 2 per cent lower than during the first 10 months of 1941, while producer's stocks increased 8.8 per cent. In the three months, August-October, 1942, production was 1.5 per cent and shipments were 32 per cent less than the corresponding time in 1941.

Beginning with the first quarter of 1942, the Maritime Commission diverted to war use all vessels which had been carrying sulphur between the Gulf of Mexico and the Pacific Coast, and vessels and barges which had been carrying sulphur to the Atlantic Coast. This made necessary the development of new channels of transportation. One of the results was that shipments to Canadian points on the Great Lakes were made via the Mississippi River to Chicago where the sulphur was transferred into lake steamers for Canadian ports.

In the case of New York harbor, with its high all-rail rate from the mines, it was found possible to move sulphur up the Mississippi River to Chicago, trans-ship into lake vessels, and trans-ship again at Buffalo into canal barges, and thence down the New York State barge canal to New York. These movements via Chicago to New York harbor and to Canadian lake ports completely reversed the movement of other years, as sulphur ordinarily reached the Canadian lake ports by way of vessel movement to Montreal and then trans-shipment into small lake steamers. New York harbor, of course, has for years been a discharging point for coastwise steamers, and many thousands of tons of sulphur have been moved by barge up the New York State barge canal to Buffalo, Cleveland, Detroit, and such other American lake ports.

The natural effect of the all-rail transportation of sulphur to the coast ports and to Eastern Canada has been to increase the cost of sulphur to the buyers. Since their business was built primarily with low transportation cost for incoming raw materials overbalancing relatively high freights on finished goods, the present rail transportation of raw material has had an appreciable effect on the economic situation of the industries using sulphur.

War Creates Demands for New Uses of Sulphuric Acid

The petroleum refining industry being a large consumer of sulphuric acid, was under heavy pressure all through the year to meet the tremendous demands of high octane aviation gasoline. The greatly increased requirements of toluol for TNT production, as well as the various raw materials for the synthetic rubber program have created a great demand for acid. Construction was started on new refineries in every oil area of the country, thereby enormously increasing facilities for the production of these materials. Furthermore, as chlorinated solvents became more difficult to obtain, there was a large increase in acid refining of lubricating oils.

More iron and steel were produced during 1942 than were made in any like period in the history of this country. This increased activity of the steel mills was also reflected in greater requirements of sulphuric acid. Copper, brass, bronze and the other nonferrous metallurgical industries called for larger volumes of acid.

The expansion in the iron and steel industry called for a correspondingly larger consumption of metallurgical coke. For the first ten months of the year, this was reflected in an increase of almost 7 per cent in the coke industry. In turn, there was an increase in the by-products produced, ammonium sulphate showing a 3.5 per cent gain, although a considerable quantity of ammonia was used as ammonia liquid instead of being used as the sulphate.

The fertilizer industry, which consumes large quantities of sulphuric acid in the production of superphosphate, also established new highs. In part this was due to the tremendous demands upon this country to feed the people of Great Britain and other United Nations which made it necessary to increase the output of foodstuffs and increase the application of fertilizer. The acid fertilizer industry also found it necessary to make up the 150,000 tons of superphosphate which had been made in 1941 by furnace method by TVA.

Loading broken sulphur into cars at the "face"

AINTENANCE HINTS FOR CUTTING MACHINES

(Hydraulically-Operated)

KEEP THE CUTTING MACHINE CLEAN

p accumulation of cuttings removed that may interfere with operation of adjustments and controls. Once a week use pressed air to blow out dirt and grease accumulation. Look le motor frames once a week. If accumulation of dirt grease is found, remove it and remove cause. Keep com-ators and brush holders clean—also inside of all electrical osures. Cleanliness helps to reveal minor defects—permits ection before they result in breakdowns requiring major airs.

MAKE SCHEDULED INSPECTIONS

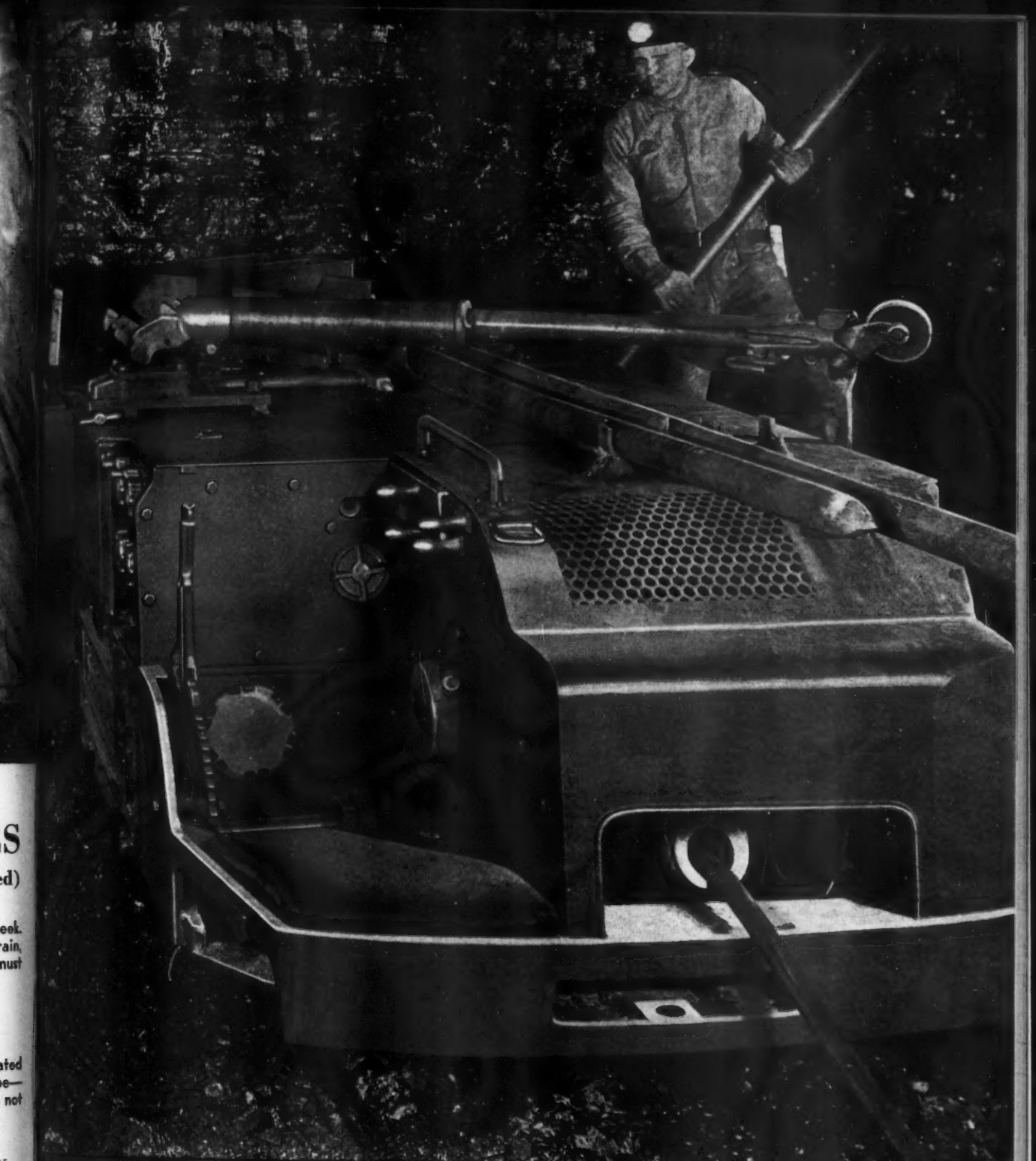
that all control contacts make good contact—replace be-too worn to function properly. Check electrical connec-s—see that they are tight. Look over gearing for any gular wear or misalignment that might reveal excessively n or damaged bearings that should be replaced. Generally e unusual noise accompanies this condition. Check cable for free operation—proper cable tension. Check all drive ns for adjustment and wear. Keep cutter chain properly sted—not too tight. At frequent intervals inspect hydraulic system for leaks. Clean out screens and filters once a week. Keep oil level up in tank. Every 150 operating shifts—drain, flush with clean oil and refill tank. Water as well as dirt must be kept out of hydraulic system.

3. LUBRICATE AT REGULAR INTERVALS

Use proper kind and proper amount of lubricant, as indicated on lubrication chart. Keep pressure fittings in good shape—handle all lubricants and lubricating devices so that they do not become contaminated with foreign matter.

4. OPERATE THE MACHINERY PROPERLY

Pause on each point of controller when starting the motor. Running through the points too quickly is detrimental to the motor, particularly the commutator. Do not run on resistance except for such speed control as may be required in tramming. Do not run with dull bits—keep cuttings shovelled away from chain. Dull bits—cuttings carried back in the kerf-cutter chain too tight . . . not only overload the machine but cut down production.



THE JEFFREY MANUFACTURING COMPANY

958-99 North Fourth Street Columbus, Ohio

Baltimore Chicago Denver Milwaukee Scranton
Cleveland Harlan New York St. Louis
Cincinnati Houston Pittsburgh Salt Lake City
Detroit Huntington Plymouth

A considerable volume of acid was used in the smokeless powder and high explosives plants operating throughout the year. Acid was in larger demand from manufacturers of rayon who were busy turning out yarn for automobile tires, parachutes and other war purposes. Anticipating the tremendous demand, sulphuric acid making facilities were increased by the construction of large Government financed plants, and the expansion of privately owned units. Several unused chamber plants in the fertilizer industry were rehabilitated and put back into operation while many acid plants operated at higher than rated capacity.

Sulphur Dioxide Used in Manganese Recovery

There were in fact extremely few users of acid who did not require much larger volumes with the result that the total consumption was a new record. Meanwhile, processes for the production of manganese from domestic ores were developed which indicate the use of very large quantities of sulphur dioxide in the near future.

The emergency brought out a wealth of new products, many of them extending the use of sulphur. One of these, a comparatively new compound, Thiokol, is a rubber-like material containing about 70 per cent of sulphur. This is expected to do much to relieve the present rubber shortage. It is reported that "retreads" of Thiokol synthetic rubber will add at least 5,000 miles to the road life of any tire that retreaders would normally accept for recapping. Thiokol synthetic rubber has been selected as one of the types offering earliest relief of the rubber shortage because the comparative ease of building plants to produce it and the abundance of the raw materials, including sulphur, from which this synthetic rubber is made. The first step taken was in November, when announcement was made that construction of a $2,500,000 plant in Texas would start immediately, as part of an expanded program which calls for an annual output above 50,000 tons. Thiokol may also help in solving the present difficulties of oil supply as its use has already been suggested for the production of oil-carrying box cars by fitting into the cars, cells made of Thiokol. These collapsible cells, when used in a standard box car, enable it to carry 30,500 gallons of liquid or almost one-third more than a standard tank car.

Sulphanilamide, the first in the "sulpha" series of "miracle" medicines, received official stamp of approval by the Army because of the sensational results obtained after Pearl Harbor and in the South Pacific. Every soldier going into a combat zone is being equipped with a spill-proof box containing a dozen sulphanilamide tablets. This medicine has been unbelievably effective in preventing infections and has already been credited with outright cures where in the past similar wounds meant almost certain death.

Sulphur flowing from the distributors onto the face of a sulphur vat. Area of vat is nearly six acres and it is five stories high

Sulphanilamide is the basis for a whole set of derivatives, sulphapyridine being the second in the series, and sulphathiazole the third. Most recent additions are sulphadiazine and sulphaguanidine. The latter is a specific for certain types of dysentery, and for this reason, heavy shipments of it have already been made from the United States to the Middle East.

Small quantities of sulphur are added to the mold when making sand castings of magnesium to prevent the metal burning. The amount of sulphur consumed for this purpose has risen rapidly as large magnesium plants have come into production.

The Agricultural Marketing Service has recently released directions for an emergency method of preserving fruits for shipment under Lend-Lease to England, known as "hot process sulphur dioxide preservation." The sulphur dioxide prevents reinfection from air borne spoilage organisms.

New attention was also accorded sulphur for use in protecting our growing food crops. Shortages due to lack of imports have developed in our supplies of rotonone and pyrethrum. Supplies of copper (an ingredient of Paris green), lead (a constituent of lead arsenate), and mercury (used in seed disinfectant) are already short. Finely ground sulphur is an insecticide and fungicide and since it is in abundant supply, it is being used as such or to eke out available supplies of materials formerly obtained from abroad.

The manufacture of sulfamic acid and ammonium sulfamate on a commercial scale commenced the first of the year. Because of their value as fire-proofing agents, the Federal Government recently took over the entire output of both chemicals.

Research Discloses Many New Uses for Sulphur

Research on wider applications for sulphur continued thoughout the year. Paper impregnated with sulphur to make it hard, semi-rigid and partially waterproof, is being adapted to the fabrication of containers, pipe and other items formerly made of metal. Corrosion resistant cements made of sulphur are being used to an increasing extent in place of lead as jointing materials for water mains and in the construction of acid-proof structures. Sulphur containing a plasticizer is being tried as a binder and substitute for plastics in various molding operations. And, finally, a new method of purifying sulphur was developed. The sulphur so purified is of scientific interest and its further study may shed new light on certain properties and reactions of sulphur. It may also prove useful to certain industries such as in the manufacture of fluorescent lamps where an exceptionally pure sulphur is required.

Notwithstanding the expanded requirements for sulphur during the past two years the American sulphur industry continues to be in a splendid position to meet what apparently are the even greater demands of 1943.

Coal Mining Has a Responsible Job in 1943

Requirements of 11,600,000 tons bituminous and 1,250,000 tons anthracite weekly for the war program will not be met on the basis of the shorter work week. A four-point program for the industry to achieve necessary production will be vigorously prosecuted.

By THOMAS J. THOMAS

Associate Deputy
Solid Fuels Coordinator for War

THE COAL mining industry produced and the transportation system moved approximately 640,000,000 tons of bituminous and anthracite coal in 1942 in spite of growing wartime handicaps. This was the largest total production since 1926, when the total output of anthracite and bituminous coal approximated 657,000,000 tons.

Included in this tonnage was an estimated 580,000,000 tons of bituminous coal and about 60,000,000 tons of anthracite. If these estimates are confirmed by the final figures, it will be the largest bituminous production in history and the biggest anthracite output since 1930.

The record soft coal production was effected in the face of shortages of manpower and equipment and it represented an outstanding accomplishment by the bituminous coal industry. It enabled the nation's consumers to build up the largest total storage of bituminous coal in history as protection against probable war emergencies.

Anthracite production lagged behind demand during the last half of 1942, providing a generally tight anthracite coal supply situation in the burning season. The outbreak of the strikes in the hard coal mines early this year further curtailed the supply, causing critical shortages in various places which necessitated emergency action.

Through the cooperative effort of the transportation systems, particularly the railroads, the heavy 1942 coal load was moved from mine to destination expeditiously, although the railroads were being required at the same time to move heavy war shipments of men and munitions and a substantial part of the oil consumed in the nation.

With the start of 1943, the coal-producing and transporting industries are facing even greater tasks and the obstacles in their paths are likewise increasing. These industries are being called upon to mine and move during the year an estimated minimum of 665,000,000 tons of coal to meet wartime requirements. This goal, which represents an increase of approximately 25,000,000 tons over the estimated 1942 output, includes approximately 600,000,000 tons of bituminous coal and more than 65,000,000 tons of anthracite.

Basically the mining industry in 1942 faced two outstanding problems, a shortage of manpower and difficulties in obtaining essential equipment and repair parts. The Office of Solid Fuels Coordinator for War is taking steps in an effort to help the industry meet these problems, and their successful solution is essential to the adequacy of the coal supply.

At the present time, the most serious of these problems is the shortage of labor, which may grow still worse despite all efforts to improve it. The Office of Solid Fuels, with the aid of the Bituminous Coal Division, made a survey of the mine manpower situation for the first quarter of 1942 and found that in that period the industry, despite active recruiting, had suffered a net loss of more than 30,000 men. Later information indicated that by the end of December the industry had experienced a net loss of about 60,000 men.

This very serious reduction in manpower is only a partial measurement of the real loss. Most of those men who left the industry were the younger, more physically fit. Also, they represented a great loss of skilled help necessary to operate the machinery upon which modern mines depend.

The manpower losses were due to men entering military service and shifts to other industries, including war plants, for higher wages and other reasons.

The industry is making an effort to replace manpower losses by upgrading workers, recalling older men, lowering physical requirements, and some mines even have employed women in certain jobs above ground. Meanwhile, numerous appeals have been made by the Solid Fuels Office, both independently and in conjunction with a committee of the Solid Fuels Advisory War Council, for action by Federal manpower and Selective Service officials to protect mine labor. It is essential that adequate personnel be available to the mining industry if we are to maintain an adequate coal supply.

Serious problems involving difficulties in obtaining equipment and materials were encountered in 1942, and the job will not be an easy one in 1943. This is a problem which must receive constant attention, since as time goes on the service life of equipment will be more rapidly depleted by the increasingly high rate of mine operations.

A vigorous effort is being made to improve the equipment and repair part situation. The War Production Board has indicated a willingness to aid in applying a corrective in recognition of coal's essentiality to fighting the war.

It will be necessary for the mining industry to depend largely upon obtaining the maximum use of existing facilities to meet expanding wartime coal requirements, in that the labor and equipment situation makes it impossible to embark upon a general program of opening new mines.

Although it has been necessary to meet emergencies in transportation, caused by the effect of the war on tidewater and Great Lakes water carriers, the transportation industry in general and the railroads in particular did an excellent job of moving coal in 1942. Car turnaround time

has been reduced, equipment is being loaded more heavily, the number of "bad order" cars and locomotives has been lowered, and there has been a general improvement in operating efficiency.

It is likely that emergencies involving transportation and other phases of the task of supplying coal will continue to occur in wartime, and we must meet them as they arise. I think it appropriate to recall briefly some of the situations that already have occurred.

In the past, New England has received most of its coal by tidewater. But the war has made serious inroads into the shipping available for this movement, and it was necessary to increase all-rail shipments and make greater use of substitute water transportation in order to supply this region.

The diversion of shipping on the Great Lakes also made it necessary to make greater use of all-rail transportation to supply users formerly served by lake colliers. The record early start of coal movements on the Great Lakes last spring was of great help in this situation.

In the Pacific Northwest, where increased demands for coal have outstripped coal production in the mines that ordinarily supply the region, mine labor shortages have caused a particularly acute situation. Action was taken by the operators and the United Mine Workers of America to increase mine working time in Far Western mines, and further efforts are being made to improve the labor supply. The manpower authorities have been requested to make available 2,000 additional experienced miners in Washington, Wyoming, Utah, Colorado, and New Mexico. As a temporary expedient to meet an acute coal shortage in the Pacific Northwest more than 100,000 tons of eastern coal have been moved to the region via the docks at Duluth and Superior, and commitments for 130,000 additional tons of coal requiring the same movement have been made.

Continuation of this wasteful use of transportation, rather than to increase production in the Far Western mines, is uncalled for, and every effort is being made by the Solid Fuels Office to improve the labor supply.

Another tight situation occurred in the Midwest, in which it was necessary to increase shipments from other states to meet a deficit in the Eastern Kansas-Western Missouri area. This deficit approximated a half-million tons during 1942. The question of the adequacy of the 1943 supply is still under close study.

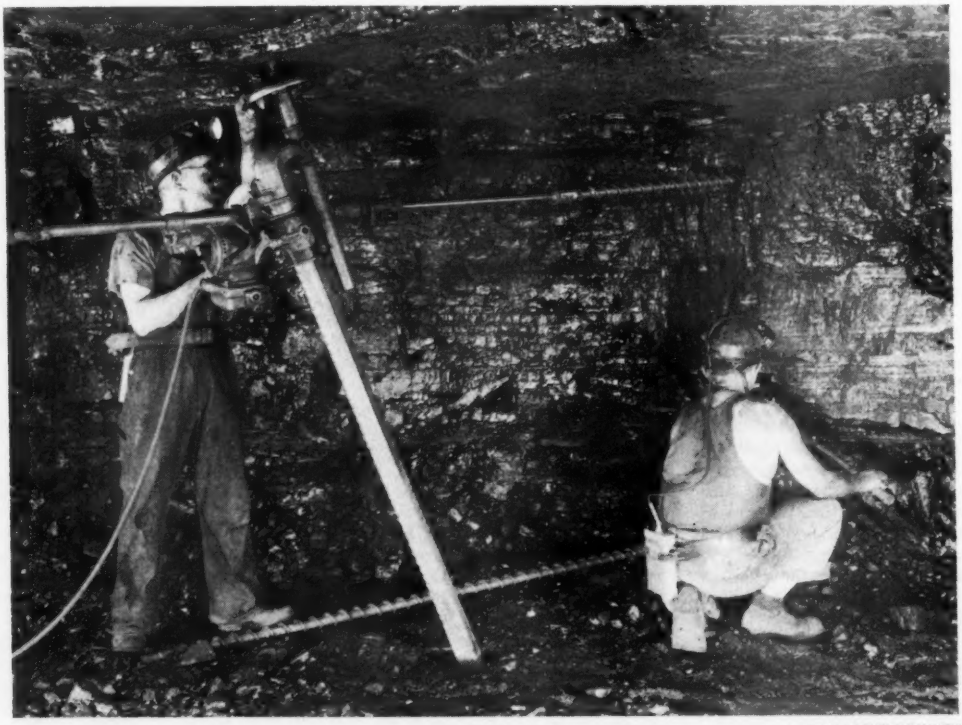
Also, emergency action was made necessary because of the critical fuel situation in the East Coast states which was brought about by the strike in the anthracite mines. These coal mines had been behind in filling orders for domestic coals for some time even before the strike, and the stoppage of production in part of the collieries greatly aggravated this situation. Anthracite producers suspended shipments to points west of Erie, Pa., and to Canada which had an adequate coal supply, or where other fuel was available, and concentrated shipments into the primary anthracite-consuming region. Furthermore, bituminous producers were asked to supply approximately 200,000 tons per week to substitute for anthracite in this area.

Although the bituminous coal industry has done a fine job in 1942, its task will be more difficult in 1943.

Solid Fuels Coordinator Ickes on last September 29 called upon the operators and miners to lift the five-day, 35-hour weekly limitation upon the hours of labor in the mines, as a step necessary to make possible adequate production for this year. In the face of the manpower shortage, and the other effects of the war that must be surmounted, it would not be possible to meet 1943 requirements on the basis of the shorter work-week.

It is inescapable that the entire industry must maintain continuous full operations on the basis of a longer mine work-week than that which has heretofore prevailed, if 1943 coal requirements are to be met adequately.

It will be necessary for everyone concerned with the coal supply, from



--U. S. BUREAU OF MINES

Electric post-mounted drill in use

the operator and the miner on down to the dealer and the consumer, to cooperate fully. A step in this direction was made in the coal stocking program in 1942. A similar program must be still more vigorously prosecuted in 1943, and the Solid Fuels Office is now planning in this direction.

The objectives of such a program should be:

1. Dealers and consumers should contract for or order their coal as soon as possible.

2. Persons placing orders or making contracts should allow the fullest possible latitude as to size and kind of coal, shipping or delivery schedules, and type of transportation equipment used.

3. Every opportunity should be seized to build up stockpiles to adequate levels.

4. When the stockpile is built up to adequate size, keep it that way as long as possible. Consume stocks only in an emergency.

The 1943 coal requirements will necessitate an average weekly production rate of about 11,600,000 tons of bituminous coal and 1,250,000 tons or more of anthracite. Since these rates approach the maximum volume possible under present manpower and equipment conditions, both mines and carriers must maintain full operations throughout the year.

If production and distribution of coal were to follow the customary prewar pattern the mines and carriers would not have the manpower or the equipment to supply all the coal required. Shortages that would handicap war production and cause suffering would result.

Bituminous coal storage in the hands of users and dealers totaled an estimated 90,608,000 tons on December 1, 1942. This far exceeded all previous records. But these figures should not induce any false feeling of security against emergencies, since a large number of users were not adequately protected. The adequacy of the stockpiles as war-time fuel insurance must be measured in terms of days' supply represented, and in light of how the stocks are distributed among users.

Although the storage represented an increase of about 8,000,000 tons over what was in stockpiles three months previously, it also reflected a decrease of four days' supply under the stocks of three months before. This was due to the increase in the rate of consumption.

As for the distribution of these stocks, a recent analysis showed that 333 companies, which consume almost 30 percent of the soft coal produced in the country, had less than 40 days' supply each on December 1, 1942. This group of companies in the aggregate had an average of only 31 days' stocks as compared with a national average of 61. It likewise disclosed that 38 Class I railroads which consume 65 percent of the soft coal used by all rail carriers had on hand an average of 31 days' supply. None of them had more than 40 days' supply.

--U. S. BUREAU OF MINES

Cleaning and laying track at working face

Among the major factors considered in estimating that 600,000,000 tons of bituminous coal would be required in 1943 were these: Railroad traffic in 1943 is expected to be about 12 percent above 1942, requiring the use of 10 percent or about 11,000,000 tons of coal additional. Steam-generated electric power requirements call for as much as 136 billion kwh. extra in 1943, thereby increasing the coal demand by at least 10,000,000 tons. Iron and steel production will require about 10 percent or 12,000,000 tons of coal more to fill their program. Deliveries from retail yards and direct from mines by truck to domestic and similar users are expected to increase 2 percent, or at least 3,000,000 tons. An increase of about 10 percent or approximately 10,000,000 tons is foreseen in the needs of other users, representing chiefly manufacturing industries whose war material production is expanding.

Anthracite requirements are estimated to be about 65,000,000 tons for 1943. The greater part of the increase in hard coal requirements is anticipated in domestic use. Much of this added need for hard coal comes from the requirements of the fuel oil conversion program, and increasing war activity in the East.

The program of conversion is adding an increased burden on the soft coal industry. As of December, completed conversions in the Eastern seaboard and Midwestern states totaled the equivalent of 8,078,000 tons of coal. More coal will be required as the rate of conversions is increased.

Despite the obstacles and uncertainties facing us this year, I feel confident that the coal and transportation industries, with sound planning and careful execution of those plans, and with the full cooperation of all persons concerned, can meet 1943 requirements. The prosecution of the war *must not* be impeded for lack of an adequate supply of coal where and when needed.

Bituminous Coal Mining Takes a Look At Its Wartime Records

Some interesting achievements in mechanized mining stand out for the industry in a comparison of developments in World War I and the present conflict. Refinements in all branches of operation have provided greater fuel value for users of coal in war as well as in peace.

By G. B. SOUTHWARD
Associate Editor

A REPORT of the progress made by the bituminous coal industry during the year 1942 should properly be prefaced with the following statement which has just been released by the U. S. Bituminous Coal Commission: "Responding to the increased need for coal to keep the war economy moving, the production of soft coal is estimated at 580,000,000 net tons in 1942, the largest output on record, and surpassed the previous peak of 579,385,820 net tons in 1918."

In comparing the tonnages for these two years, one factor should be taken into account—the quality of the coal loaded for shipment. Coal cleaning in the modern sense did not exist in 1917-1918, and beyond a small amount of hand-picking for the larger sizes, the product was sold as mined at the face; enforcement of quality specifications was extremely lax and the ash content of the country's production as a whole was very much higher in those days than in 1942, when close to one-fourth of the bituminous output was mechanically cleaned. If actual figures could be calculated for the fuel value of the coal loaded in these two war periods, we would find that 1942, on a fuel value basis, exceeded the peak year of 1918 by several million tons. Continuing this line of thought, we further find that the improvements in combustion efficiency by consumers over the past twenty years—50 percent by railroads, 100 percent by electric utilities, 25 percent by blast furnaces—have added the "industrial value" equivalent of another 100 million tons to present annual coal production as compared to 1918.

Similar Production Increases Feature the Two War Periods

The 1942 record marks a real accomplishment in coal's history, and a better understanding of how modernized mining has functioned in the present emergency can be brought about by looking back to World War No. 1, when a similar demand for a great volume of coal was faced and met by the industry. The curves of bituminous production for the past three years and for the corresponding period of World War No. 1 are nearly parallel; from 1915 to 1918 the tonnage was raised from 443 million to 579 million, while from 1940 to 1942 the increase was from 461 million to 580 million. Here, however, the parallel ceases and there is little similarity between the courses followed to gain production in these two periods. During the first war the procedure was to open new mines and employ more men, but today the technique is to add machinery and raise the productive capacity of the present operations and personnel. A few figures given in the following paragraphs will illustrate how times have changed.

In the Era When Machines Replace Mines

At the beginning of 1916 there were 5,500 bituminous mines in operation, but by the end of 1918 this figure had approached 9,000 and the number of men employed had increased in that same period from 557,000 to 615,000. The average production per man shift was 3.8 tons. During the following twenty years, hundreds of coal mines were closed down and abandoned so that by 1940, which marked the end of the prewar era, the active operations had been reduced to 6,300 with 439,000 employes; the production per man-shift, however, had increased to 5.2 tons. It may be of interest to note that in 1940, less than 1,500 mines produced more than 90 percent of the total bituminous output, and a matter of further interest is that in both of the World War periods there were almost the same number of small producers—around 3,600—each having an annual production of less than 10,000 tons. (The poor, we always have with us.)

The demand for fuel to supply the growing defense program began to be felt in 1941, and at the end of that year we were again in the 1917 position of having to produce great quantities of coal for war needs. There were, however, two marked differences from the 1917 period. In 1942 it was not possible to open a large number of new mines because of shortages of material, and neither was it possible to add many more miners; in fact, the coal industry was losing men. This situation meant that the only way to get greater tonnage was by increasing the working time and by raising the productivity of the existing operations. This program was adopted, working time was extended to the full 35-hour week limit for men already employed, and where a reserve supply of labor was available, multiple shifting and, in some cases a six-day week, by rotation of crews, were put in operation. However, these measures in themselves would not have sufficed with hand methods and the present production level was reached through the expansion of mechanization—an increased use of loading machines and conveyors underground, and power shovels in open pits. Supporting evidence for this statement is in the following paragraph, based on figures taken from articles published

elsewhere in this issue dealing with underground equipment and strip mining.

In 1941 the bituminous mines had 2,000 mobile machines and 3,600 conveyors in operation; in 1942, 352 additional loaders and 1,167 conveyors were installed. The figures for the production of this equipment in 1942 have not yet been compiled, but we can form a fairly close estimate from the trends of recent years. In 1940, 148 million tons of bituminous coal was mined with loaders and conveyors; this was raised in 1941 to 187 million tons, and it is probable that the 1942 mechanized tonnage reached 235 million tons or 40 percent of the U. S. total. Strip mining in this same period gained from 43 million to an estimated 70 million tons, while hand-loading remained nearly constant.

As shown in the accompanying tabulation, the bituminous increase of 119 million tons in the past two years was made almost entirely by machines, and it becomes clearly evident that, under the present shortage of men and materials, a physical impossibility would have been faced by the coal industry if it had been forced to meet the war demands with hand mining.

Manpower Constantly in Demand for Greater Output

There were fewer men needed to mine the coal produced in 1942 compared to 1918, as the tonnage per man-shift has raised from 3.8 to 5.2 tons in that period, but the manpower question today is much more serious than it was a generation ago. Mechanization requires that a large proportion of the employes of a modern mine must be trained for special jobs, and during the past year an appreciable percentage of these skilled workers have gone into the armed forces by volunteering or draft induction, and an equally large number have transferred to other war industries. In most bituminous fields today there is an actual manpower shortage and while the coal industry so far has been able to supply the country's needs, it is easy to foresee that a further loss of men would not only cripple present tonnage but would also make an increased production impossible. Steps have been taken which have produced some corrective effect, such as the occupational draft deferment for skilled miners; absenteeism and transferrals are being combated by educational campaigns stressing that coal means powder, guns, tanks, ships and other war material; and miners' committees are making personal appeals to workers who habitually work only part time.

In spite of these efforts it is still necessary to hire men, and a great many of the replacements have had no previous underground experience.

Good maintenance of haulways increases production

The customary practice of placing a new man under the personal direction of an experienced miner must of course be followed, but in mechanical mining vocational training is becoming widely used to speed up the time required for a worker to become effective. The extension courses inaugurated some years ago by the universities of most of our coal producing states have done excellent work, and these efforts are being furthered by training schools established in cooperation with mining companies.

TABLE I

BITUMINOUS PRODUCTION MINED WITH VARIOUS METHODS OF LOADING

(From reports by the U. S. Bituminous Coal Commission)

	Total U. S. tonnage	Mechanized loading*	Strip mining	Hand loading
1940	461,000,000	148,000,000*	43,000,000	270,000,000
1941	514,000,000	187,000,000*	55,000,000	272,000,000
1942 (a)	580,000,000	235,000,000	70,000,000	275,000,000
Increase, 1940–1942	119,000,000	87,000,000	27,000,000	5,000,000

(a) Estimated from private sources.

* The division of this tonnage has stayed remarkably constant at 76% by mechanical loading and 24% by conveyors.

New and Improved Designs Await the Postwar Period

There is not much to report on the progress of machine design during the past year. Owing to the extra demand upon manufacturers for war materials of various kinds, in addition to the increased demand from regular mining channels, there has been no time or opportunity for new developments in the machines for loading, conveying, cutting, haulage and other mining operations. Some improvements have been made in certain details of this equipment, but for the most part the 1942 models are similar to those of 1941. The operating methods for track and tractor-mounted mobile loaders, stationary conveyor loaders and hand-loaded conveyors have become standardized and probably will remain so for the duration; service haulage with mine cars or shuttle cars, and belt conveying for intermediate gathering haulage have followed previous trends. There have been practically no experiments with new mining systems and, in fact, the whole effort during 1942 was in developing practices for conserving equipment and increasing production with the types of machines and the methods of operation already in use. A number of revolutionary changes in machines and methods for underground loading and transportation, as well as for cutting and other face work, had reached the drawing-board

stage prior to Pearl Harbor, but practically all of these have been filed away and are being held for the postwar period.

Operators Intensify Their Conservation of Equipment

Practices have been adopted for conserving material, reclaiming parts and rebuilding equipment that are very radical departures from usual custom. Although coal mining has been classed as an essential war industry by WPB and has been given a high priority rating for obtaining machines and supplies, the heavy demand of all industry has naturally slowed up delivery in spite of the best efforts of the manufacturers. In order to meet this situation, mining companies have evolved many ways to cut down purchases and overcome delivery delays. Much material is being reclaimed from salvage which in normal times would have been sent to the scrap pile, and in a number of cases, obsolete machines have been reconditioned at the mine shops and put back into temporary service, pending the arrival of new equipment. Some of the reclamation practices are only economical in a time-saving sense, but other methods have been discovered that unquestionably will be retained after the duration.

Welding and metal spraying have been responsible for the greatest volume of recovered material, and hundreds of examples, as practiced by hundreds of mines, could be cited, covering car and locomotive wheels, sprocket teeth, shafting, frogs and switches, as well as heavy locomotive frames and mine car bodies. Track welding is eliminating rail joints and copper bonding; used bolts are being rethreaded, rail straightening machines have recovered steel; screen plates and woven wire screen cloth are being repaired by patching the worn areas. One of the more spectacular examples of reclamation occurred at a mine where five miles of trolley wire was made by welding short pices of scrap wire—ranging from 5 to 20 ft. long. In this case the weld was made without a flux by using pure copper which had been recovered from burned-out field coils.

Strict attention to maintenance and proper use of equipment have resulted in longer service for machines and parts; in one instance, through the cooperation of the machine men, injuries to trailing cables were reduced to the point where it is estimated that the usual life of the cables was increased at least five times. Wear on cutting machines has been lessened by using only sharp bit points and replacing these when slightly dull. Armature band clips are made from tin cans; steel is being saved by substituting treated timber in place of rail or structural beams for mine roof support in long life entries. Last, but by no means least, coal itself is being conserved, by mechanical cleaning of mine refuse to recover fuel that formerly went to the slate dump.

Possible Future Production

A review of the bituminous tonnage figures for 1942 indicates that the maximum for sustained production was 11½ million tons per week, or as given in the U. S. Weekly Coal Reports, an average of 1.9 million tons per day. This latter figure, however, is calculated on a six-day week, and since the majority of the industry is on a five-day schedule, the combined producing rate for all bituminous mines operating in 1942 was undoubtedly in excess of 2 million tons per day. Increased production, therefore, seems feasible by the adoption of an actual six-day workweek and another source of additional tonnage would be through further multiple shifting. Although we cannot estimate with any accuracy the present average shift production for bituminous mining as a whole, because practice varies from one to three shifts in different companies and in different fields, we do know that if additional manpower, machines, equipment and transportation are made available a very substantial increase of coal could be mined by an extension of the working time. A mathematical computation of the possibilities of a universal three-shift, six-day week gives a seemingly fantastic production figure, but it is worth keeping in mind that predictions which seemed equally fantastic a year ago were actually achieved by the aircraft, shipbuilding and other war industries. But, either by fact or figure, the conclusion is the same—the 1942 bituminous tonnage does not represent the limit, and if our country needs more fuel, the coal industry will produce it in any amount required to win the war.

--ASSOCIATION OF AMERICAN RAILROADS

Speeding coal to the war industries, a splendid job by the railroads in 1942

Progress in the Anthracite Industry, 1942

The war program has emphasized the growing importance of anthracite, and operators are prepared to supply the urgent demands for 1943. Absenteeism and shortag of manpower continue to beset the industry.

By W. H. LESSER
Pierce Management, Scranton, Pennsylvania

MANY DEVELOPMENTS, in 1942, helped the anthracite coal mining industry to progress, but there were, however, other conditions which influenced adversely the improvement anticipated a year ago. A balance of the favorable and unfavorable factors shows definite industry progress measurable by an estimated increase over 1941, in working days and commercial production of 23 and 10 percent, respectively. This performance so improved the cash position of some companies that funds were released for the property investments required to maintain production allotments. The relatively better condition of the anthracite business freshened the mental attitude of those executives who spend much time on industry problems.

Table I shows the commercial production of the industry since 1932. A record of 250 days worked in 1942 is the best since 1924.

Shipments to Canada and New England showed appreciable increases over 1941.

Federal Influences

Like other industries, the activity of the anthracite industry was affected importantly by Federal authorities. An instance of this was the order to make a necessary annual saving of 57,000,000 barrels of heavy oil. A saving of such magnitude will make conversions from a liquid to a solid fuel mandatory. The anticipated increase in the consumption of anthracite, when and if the conversions eventuate, caused some consumers to be concerned about the continuity of their supply. For the purpose of allaying their fears, C. F. Huber, president of the Anthracite Institute, advised the public that the supply of anthracite will be adequate to meet all heating requirements. At the close of 1942, around 4 percent of the domestic oil burning furnaces were converted to anthracite, which will result in an estimated increase in the annual production of 600,000 tons.

Standard domestic anthracite burning grates were designed by Anthracite Industries, Inc., and sources of supply designated for consumers who decide to convert their furnaces from oil to anthracite. Dealers were advised not to make conversions unless they meet the recommended standards; because it is obvious that intelligent procedure will result in retaining, during the post-war period, the business thus reclaimed.

An effort to coordinate the fuel situation of the nation was made when Solid Fuel Coordinator H. L. Ickes, appointed these associate directors: Ralph Russell, transportation; Brig. Gen. Brice P. Disque, anthracite; Thomas J. Thomas, bituminous; and Harold M. Chapman, coke.

TABLE I

Year	Days worked	Commercial Production Net tons
1932	162	46,447,000
1933	182	46,584,000
1934	207	54,042,000
1935	189	49,412,000
1936	192	51,874,000
1937	189	49,184,000
1938	171	43,786,000
1939	183	49,073,000
1940	186	49,229,000
1941	203	54,107,000
1942 (Estimated)	250	59,518,000

Federal authority authorized the construction of oil pipe lines to the East coast of the country for the purpose of relieving oil transportation facilities. They forecast an ominous effect on the solid fuel industry during the period following the war.

Manpower Shortage and Absenteeism Reduce Output

Reports from the Scranton district of the United States Employment Service show that 83 mining companies covered by the survey are in need of around 3,500 additional mine workers; most of them are wanted in the Wilkes-Barre-Pittston area. An effort has been made to fill these vacancies through employment agencies in the Schuylkill area where the lack of workers is not as acute.

About the middle of the year absentees caused production losses which amounted to as much as 178,000 tons a month. Over one-half of the lost time was considered to be voluntary and avoidable.

An amendment to the general agreement between operators and mine workers made possible a six-day work week. Time and one-half, and rate and one-half will be granted the workers for overtime. The lifting of present ceiling prices will increase earnings to an extent required to meet increased mining costs.

Men prominent in industry affairs addressed regional mass meetings of miners on the necessity of increasing production. A drive was made to reduce the growing list of absentees which, together with other conditions, have reduced by 20 percent the production allocated to the industry. Plans contemplate the presentation of an "A" flag to collieries showing excellent attendance records.

Of noteworthy interest was the action of the Jeddo Highland Coal Company when, during the Christmas season, the 178 men in the armed forces of the nation were thoughtfully remembered. Each man was sent a gift consisting of a writing set and a sewing kit.

Several Abandoned Properties Rehabilitated

Confidence in the industry is confirmed when funds are spent to rehabilitate abandoned mines. Instances of such activity are: Loree Colliery of the Hudson Coal Company; Rahn Mine of the Lehigh Navigation Coal

Company, Inc.; and John Veith Colliery, recently purchased by Mr. W. S. Jermyn, of Scranton, who contemplates the construction of a new breaker on the property.

Because of the availability of coal lands released by operating companies in the Southern field, new sources of mine, stripping, and bank-coal have been developed. Tonnage from these mining projects is transported considerable distances by rail to breakers in need of additional run-of-mine. This class of production is now of such size that it is difficult to find the necessary cleaning facilities at a reasonable distance from the point of origin.

A bill passed by Congress appropriated $450,000 to rehabilitate the anthracite industry through a comprehensive research program supported by a modern laboratory. These objectives are contemplated: better mining; preparation and utilization of anthracite; new uses and markets; more safety; and better health for mine workers.

More than 80 percent of the operating companies have agreed to support a much enlarged program of Anthracite Industries, Inc., which will include the development and improvement of coal burning equipment to meet the anticipated competition of fuels during the post-war period. Research work now conducted at Mellon Institute will be consolidated under the direction of Dr. H. J. Rose at the Primos Laboratory.

Active, indeed, was the Anthracite Institute under the direction of L. C. Madeira, III, in supplying the industry with production data, and stimulating good public relations.

The Technical Advisory Board of Anthracite Industries, Inc., entered a second year of activity with plans to cooperate with governmental agencies and equipment companies for the purpose of insuring all consumers the satisfactory and efficient utilization of anthracite.

At the annual Anthracite and Bituminous First-aid Contest, sponsored by the State Mining Department, and held at Kingston, the first prize was awarded to Maple Hill Colliery of the Philadelphia & Reading Coal & Iron Company with the near-perfect rating of 99.8 percent.

The Federal inspection of anthracite coal mines starts a second year with a record of a job well done. For the purpose of assisting the inspection department, the Bureau of Mines issued a tentative list of safety standards recommended to safeguard the lives and health of mine workers, to protect property, and to improve operating efficiency.

A working period of 82,638 manhours with three lost-time accidents causing 18 days of disability was the safety record of the Eddy and Joe mine near Scranton. As a reward for this commendable accomplishment, the mine was awarded the safety trophy of the Bureau of Mines.

TABLE II

Records of Fatal Accidents in the Anthracite Industry

Year	Number of fatalities	Production per fatal accident Tons
1935	267	192,356
1936	241	225,162
1937	211	245,025
1938	223	207,487
1939	209	240,308
1940	180	286,258
1941	189	281,516
1942 to Oct. 31	191	249,356

Studies of Drainage Problems Necessary

During May a flash flood not only reduced production for several days, but it drew attention to the inadequacy of mine pumping plants to handle abnormal floods. As a result of the unprecedented rain, one mining company constructed a drainage ditch of considerable size to divert water from the mines. Soon after its completion, another storm proved the value of the project when 5,000 gallons per minute of water were diverted to outside drainage channels. Interest was revived also in the petition before Congress by the Southern Anthracite Drainage Association for an appropriation of $300,000 to make a survey of the drainage problem in the entire anthracite mining area.

Methods to prevent the pollution of the Schuylkill River with solids from mining operations were the subject of a report from an Industry Pollution Committee to the State Sanitary Water Board. It agreed with the following suggestions from the United States War Department: the construction of desilting basins in the river somewhere below the coal region is the most practical solution of the problem. Efficient desilting plants are now operated at the mines by over 50 percent of the producers in the Schuylkill drainage area.

When, in March, 1941, the first survey of the bootleg mining industry was made, there were 3,000 holes, and 341 breakers in operation. Draft requirements, difficult mining conditions, and the absorption of miners by regular mining companies reduced the foregoing by November, 1942, to 1,131 active holes, and 182 breakers. During 1942 the tonnage of bootleg coal entering the anthracite market declined from around 6,000,000 to 3,000,000 tons annually, of which 60 percent was sold to legal coal mining companies. Further reductions in the business may be reasonably expected.

Preparation problems have become more complicated because breakers are required to clean a product originating in mines, strippings, bootleg operations, and refuse-banks. Under such conditions, a run-of-mine yielding 50 percent of coal is not uncommon.

Even though funds for improvements were difficult to earn, new breakers were placed in operation during 1942. Those breakers deserving special mention were: Hazleton shaft, Lehigh Valley Coal Company, and Packer No. 5 Colliery, East Bear Ridge Colliery Company. Each was equipped with Chance cones, and Wilmot hydrotators.

Much new coal cleaning equipment was installed in old breakers for the purpose of increasing their capacities, or improving the quality of the coal shipped. The type of cleaning equipment selected by preparation engineers was:

Name	Capacity of cleaned coal per hour, net tons
Wilmot hydrotators	475
Wilmot hydroclassifiers	30
Wilmot jigs	35
Chance cones	900
Menzie cones	700
Diester concentrator tables	123
Total	2,263

Research concerning the use of the froth flotation process for cleaning anthracite fines was conducted by the Lehigh Navigation Coal Company, Inc. Because of satisfactory pilot plant tests, a decision was made to build a flotation plant with a capacity of 50 tons of cleaned coal per hour. A plant of this type will make a marketable product from silt, now the cause of stream pollution. The cleaned product will size as follows:

Retained on	Cleaned product percent by weight
No. 14 Mesh	0.7
No. 20 Mesh	1.7
No. 28 Mesh	3.7
No. 35 Mesh	6.8
No. 48 Mesh	10.4
No. 100 Mesh	30.0
No. 200 Mesh	23.3
Through No. 200 Mesh	23.4

Installations were made of equipment to clean separately the smaller sizes, buckwheat to No. 4 buckwheat, inclusive. The process is based upon the principle of separating heavier from lighter particles when both are carried by a flowing stream of water in a launder. Little space is required by the machine which does not involve a large investment.

An abnormal demand for the prepared sizes, nut and stove, accelerated studies to increase their volume through improved roll practice. Not-

withstanding this work, and considering the increased production of smaller sizes, the percentage of prepared sizes produced by the industry is practically unchanged.

On account of an anticipated shortage of sheet steel used to line breaker chutes, service tests are being conducted of plate glass liners. The results of the tests will be available at a future date.

Mechanized Equipment in Demand

Improved mining methods continue to be adopted when and where conditions permit. A plan to mine a 4 ft. bed of coal was executed by the Haddock Mining Company at Beaver Meadow Colliery. Shuttle cars, coal cutters, and shaking conveyors were involved in the project.

Estimates concerning the mechanical mining equipment furnished to the industry in 1942 indicate it to be: 200 electrically operated shaking conveyors; 50 compressed air shaking conveyors, and 50 chain conveyors. Conway shovels for loading cars in tunnels and gangways are in good demand, 10 are now in operation with good prospects for the future. The apathy of labor regarding these machines will influence, no doubt, their general adoption.

Dry ice, frozen carbon dioxide, was used to extinguish a fire in a mine of the Alden Coal Company. About 3 tons of the ice were placed behind the seals, and 72 hours after its introduction the oxygen content of the air dropped from 20 to 6.8 percent.

Of more than ordinary interest is the action of the Hudson Coal Company in modernizing the Pine Ridge mine car repair shop where 3,000 cars are repaired. Modern tools and shop methods have accomplished this result: the cost of labor per dollar of material consumed in nine old shops was 58 percent higher than in the Pine Ridge shop. A saving of such magnitude has induced the management to build a similar shop at Olyphant Colliery.

Maintenance men are doing a noteworthy job in keeping plants in operation with reclaimed material and made-over parts. Welding, both electric and acetylene, makes possible the rebuilding of mine car wheels, locomotive tires, sprocket wheels, rail frogs, engine frames, pedestals, and crusher segments. Since the advent of the metal spraying process, the opportunity to recondition machinery has been extended quite considerably.

There seems to be no marked reduction in the production of coal from stripping operations, especially in the Southern Field where earnings would be curtailed seriously if no stripping coal were available. Credit is due shovel manufacturers for designs which make possible the profitable operation of deeper strippings with increasing ratios of overburden to coal. Just a few years ago certain projects were considered unprofitable, and therefore abandoned; but buckets of greater capacities, the walking type shovel, and larger booms made it possible to rehabilitate them at a profit to contractors and mining companies.

During 1942 approximately 37 shovels with a total bucket capacity of 90 cu. yds. were placed in the anthracite area at an approximate cost of one and one-half million dollars. The largest shovels were equipped with 8 yd. buckets and 200 ft. booms. They were operated by purchased electric power and equipped with the Ward Leonard control.

The trend is toward larger drag line walking shovels, practical only because contracts involve a yardage of sufficient size to warrant heavier investments in equipment. Shovels with 3 yd. buckets and smaller are powered with Diesel engines which result in greater mobility. Equipment of this type may be moved to outcrops in seemingly inaccessible locations.

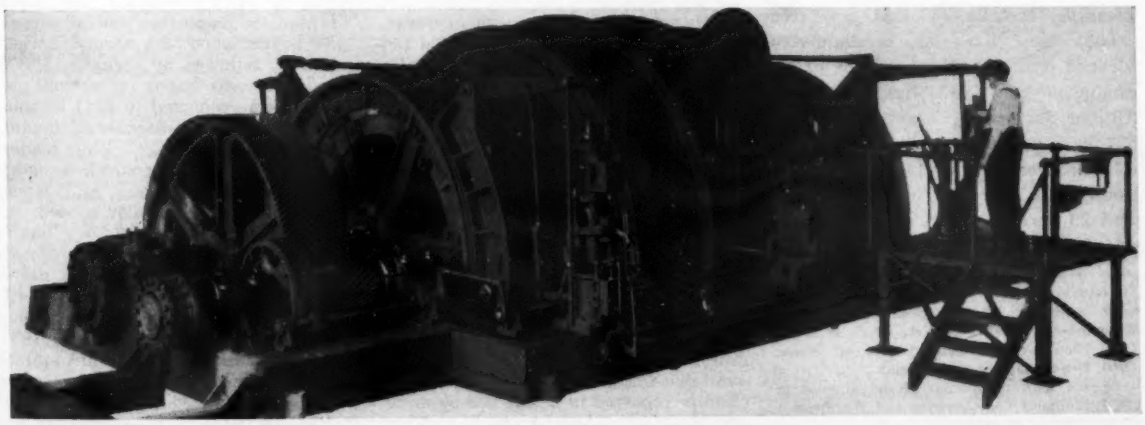
An electric shaft hoist is under way by the Lehigh Navigation Coal Company, Inc. It will be equipped with a 1,750 hp. alternating current motor, two cylindro-conical drums, each 9 to 15 ft. diameter, and capable of laying ultimately 1,676 ft. of 1⅝-in. rope. A hoisting speed of 2,980 ft. per minute will make possible 93 trips per hour from the present level, 902 ft. below the landing. Excluding the motor, the hoist will weigh 155 tons.

The Locust Coal Company accomplished several operating advantages by placing a deep well pump on the end of the suction pipe of a 1,500 g.p.m. station pump. A 10 hp. vertical motor, mounted on a suction line tee, drives the "suction booster pump" through a vertical shaft in the center of the pipe. Air is prevented from entering the pump by a gland through which passes the driving shaft.

Because of the construction of a new breaker at the Packer No. 5 Colliery of East Bear Ridge Colliery Company, a complete replacement of an existing substation was necessary. Of interest to electrical men is the new substation containing three 1,500 kva. transformers, high voltage 66,000 volts, and low voltages 2,200 and 440 volts. Copper tubing was used in both the high and low tension bus construction.

The closing year finds the industry alert to the increased demand for anthracite which will result from a nation at war. To meet the demand fully, requires not only the patriotic cooperation of management and labor; but the necessary manpower, materials, and resources. Past industry records, during war periods, show a production contribution comparable with other great industries, and they will, no doubt, be repeated during the present conflict.

New hoist for the Lehigh Navigation Coal Company, Inc., Pennsylvania



War Conditions Influence Sales of Coal Mining Equipment in 1942

SALES of mechanical loading equipment for use in underground coal mines decreased in 1942 from 1941. Installations of mechanical cleaning equipment at bituminous mines were also less in 1942 than in 1941. This was due in part to some of the manufacturers devoting a portion of their facilities to war work.

The total capacity of mechanical loading equipment sold to the bituminous coal, anthracite, and lignite industries in 1942 was 7.7 percent less than that of 1941, and the capacity of mechanical cleaning installations at bituminous mines was 20 percent less in 1942 than 1941.

This survey was made possible by the courteous cooperation of all known manufacturers of mechanical loading and cleaning equipment in the United States, supplemented with data from various trade journals.

During 1941 there were 186,667,250 net tons of underground bituminous coal and lignite mechanically loaded, and 13,441,987 net tons of underground anthracite, a total of 200,109,237, or 39 percent of the total production from underground mines. In 1940 34 percent of the total bituminous, anthracite, and lignite underground production was loaded mechanically.

Bituminous coal mechanically cleaned in the United States in 1941 totaled 117,539,522 net tons. This figure includes Alaska, which had one cleaning installation that produced 69,665 net tons of mechanically cleaned coal. Total production of bituminous coal and lignite in the United States and Alaska was 460,771,500 net tons in 1940 and 514,149,245 net tons in 1941. Twenty-two percent of the total output of 1940 and 23 percent of the 1941 was produced as mechanically cleaned coal.

Over a nine-year period all types of mechanized equipment increased 69 percent in bituminous coal mining and 103 percent in the anthracite mines, thereby making coal mining a better trained and equipped industry for World War II.

By W. H. YOUNG, R. L. ANDERSON, G. A. LAMB and J. W. BUCH*

Mechanical Loading of Bituminous Coal, Anthracite, and Lignite

Table 1 shows the number of units of mechanized loading equipment sold to bituminous coal, anthracite, and lignite mines for underground use, as reported by manufacturers, for the years 1935 to 1942, inclusive.

Total number of mobile loaders sold decreased from 368 in 1941 to 352 in 1942, or 4.3 percent. Although 1942 sales were less than 1941, they were the second highest year on record. Sales of scrapers rose from 11 in 1941 to 29 in 1942, an increase of 163.6 percent.

Conveyor sales in 1942 amounted to 1,491 units. This figure does not include sales of duckbills, which has been included in all previous years. Therefore, the figure for 1942 is not comparable with 1941 or earlier years. However, the capacity of conveyors sold in 1942 was 16.5 percent less than the capacity of similar sales in 1941. By excluding sales of duckbills some of the overlapping of conveyor sales is eliminated. For instance, in 1940 there were 2,919 conveyors, hand-loaded and those equipped with duckbills, in active use at bituminous coal and lignite mines, as reported by mine operators. By adding 1940 bituminous and lignite conveyor and duckbill sales of 1,573 units, there appears to be 4,492 units available for use in 1941, whereas the number reported in active use by mine operators was 3,595, or 897 less. This difference of 897 represents idle or worn out and obsolete equipment, duplications in reporting sales, and a small number of conveyors which were used in conjunction with mobile loaders.

Pit-car loader sales dropped to the low figure of 2, which equals the lowest previously recorded, that for the year 1939.

Regional distribution of sales.—Table 2 shows the total number of units of mechanical loading equipment of all types sold in the various states and regions in 1942. Types of equipment sold in approximate order of capacity are shown by letter symbol. For example, 309 mechanical loading units of equipment were sold in Pennsylvania. In this total of units sold, mobile loaders (indicated by "L") furnished the largest addition to capacity and conveyors ("C") furnished the second largest addition, followed by scrapers ("S"). Capacities are based on actual performance as reported in 1941 by mine operators. Of all mechanical loading equipment sold in 1942, mobile loaders furnished the greatest added capacity, with conveyors, scrapers, and pit-car loaders following in order named.

Types of machines sold for use in bituminous, anthracite, and lignite mines compared with units in use.—Table 3 shows the number of the different types of mechanical loading equipment in active use since 1933. Mobile loaders in use in bituminous and lignite mines as reported by mine operators increased from 523 in 1933 to 1,985 in 1941. Scraper units in use

* Messrs. Young, Anderson, and Lamb are staff members of the Economics Branch, Bituminous Coal Division; Mr. Buch is Chief, Coal Economics Division, Bureau of Mines, U. S. Department of the Interior.

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at bituminous and lignite mines show little change, increasing from 93 in 1933 to 109 in 1941. At bituminous and lignite mines conveyors equipped with duckbills and other self-loading heads in active use increased 497 percent and the number of hand-loaded conveyors increased 435 percent from 1933 to 1941. Mechanical loading equipment of all types in active use at bituminous and lignite mines as reported by mine operators increased from 3,726 in 1933 to 6,296 in 1941, an increase of 69 percent, while all types in use at anthracite mines increased from 1,444 to 2,937, or 103 percent, during the same period.

Total sales of all types of mechanical loading equipment sold to the bituminous and lignite industry in 1942 amounted to 1,536 units, which was 24.4 percent of the total number in active use in 1941, while the total number of units sold to the anthracite mines in 1942 was 338, or 11.5 percent of the total number in use in 1941.

Types of equipment purchased by regions in 1942.—The number of mobile loaders, scrapers, and conveyors shipped into the various states and groups of states in 1942 and the number of units in actual use in 1941 are shown in Table 4. All of the 352 mobile loaders sold in 1942 were shipped to bituminous coal and lignite mines. Pennsylvania bituminous mines received the largest number of mobile loaders sold in 1942, with West Virginia in second place and Alabama and Kentucky tied for third place.

There were 29 scraper units sold in 1942, the bituminous mines receiving 15 units and the anthracite 14. No scraper units were sold in 1942 for use in lignite mines.

Conveyor sales in 1942 in relation to the number in actual use in 1941

TABLE 1

UNITS OF MECHANICAL LOADING EQUIPMENT SOLD TO BITUMINOUS COAL, ANTHRACITE, AND LIGNITE MINES FOR UNDERGROUND USE IN THE UNITED STATES, AS REPORTED BY MANUFACTURERS, 1935 TO 1942, INCLUSIVE

	1935	1936	1937	1938	1939	1940	1941	1942	Percent change, 1942 from 1941
Type of equipment:									
Mobile loaders	115	344	292	241	292	233	368	352	— 4.3
Scrapers [1]	22	28	29	10	26	39	11	29	+163.6
Conveyors [2]	681	994	1,095	990	1,311	1,762	2,130	[3] 1,491	[3]
Pit-car loaders	28	11	32	139	2	3	10	2	— 80.0
Total, all types	846	1,377	1,448	1,380	1,631	2,037	2,519	[3] 1,874	[3]
Manufacturers reporting	28	28	28	29	31	32	32	28	

[1] Reported as scrapers or scraper haulers and hoists.
[2] Includes hand-loaded conveyors and those equipped with duckbills and other self-loading heads. Sales of both loading heads and shaker conveyors are counted for years 1935 to 1941, inclusive, but the figure for 1942 does not include loading heads separately; see text for additional explanation.
[3] Not comparable with previous years; see note [2].

TABLE 2

TOTAL NUMBER OF UNITS OF MECHANIZED LOADING EQUIPMENT SHIPPED FOR USE IN EACH STATE OR REGION IN 1942

(L—Mobile loading machines; P—Pit-car loaders; S—Scrapers; C—Conveyors)

State and region	No. of units of all types shipped in 1942	Types of equipment in approximate order of capacity in 1942
Northern Appalachian States:		
Pennsylvania	309	L. C. S.
Ohio	106	C. L.
Southern Appalachian States:		
West Virginia	565	C. L. S. P.
Virginia	47	C. L.
Kentucky	113	L. C.
Alabama	136	L. C. S.
Tennessee	23	C.
Middle Western States:		
Illinois	60	L. C.
Indiana	15	L. C.
Trans-Mississippi States:		
Arkansas, Oklahoma, and Iowa	44	C. S. L.
Colorado	25	C. L.
Montana and Utah	61	L. C. S.
New Mexico, North Dakota, and Washington	5	L. C.
Wyoming	27	C. S.
Total bituminous and lignite	1,536	L. C. S. P.
Pennsylvania anthracite	338	C. S.
Grand total	1,874	L. C. S. P.

TABLE 3

SALES OF MECHANICAL LOADING EQUIPMENT IN 1942 COMPARED WITH TOTAL NUMBER IN ACTIVE USE IN PRECEDING YEARS

	Number of machines in active use as reported by mine operators									No. of machines sold as reported by manufacturers in 1942
	1933	1934	1935	1936	1937	1938	1939	1940	1941	
Bituminous and lignite mines:										
Mobile loading machines	523	534	657	980	[1]	1,405	1,573	1,720	1,985	352
Scrapers	93	119	78	106	[1]	117	131	116	109	15
Pit-car loaders	2,453	2,288	2,098	1,851	[1]	1,392	873	697	607	2
Conveyors equipped with duckbills and other self-loading heads	132	157	179	234	[1]	346	559	656	788	[2]
Hand-loaded conveyors—number of units	525	574	670	936	[1]	1,526	1,834	2,263	2,807	[3] 1,167
Anthracite mines (Pennsylvania):										
Mobile loading machines	18	14	1	[4]	[5]	[5]	[5]	[4]	[4]	...
Scrapers	455	517	507	[6] 504	539	545	535	[6] 547	[6] 505	14
Pit-car loaders	19	25	22	[5]	[5]	[5]	[5]	[5]	[5]	...
Conveyors equipped with duckbills and other self-loading heads	12	13	30	[5]	[5]	[5]	[5]	[5]	[5]	[2]
Hand-loaded conveyors—number of units	940	1,338	1,563	[7] 1,790	[8] 1,855	[8] 1,831	[8] 1,997	[7] 2,189	[7] 2,432	[8] 324

[1] Data for 1937 not available for bituminous and lignite mines.
[2] Included with hand-loaded conveyors. In sales for 1942 loading heads were not counted as a separate unit.
[3] Includes conveyors equipped with duckbills.
[4] Included with scrapers.
[5] Included with hand-loaded conveyors.
[6] Includes mobile loading machines.
[7] Includes pit-car loaders and conveyors equipped with duckbills and other self-loading heads.
[8] Includes mobile loading machines, pit-car loaders, and conveyors equipped with duckbills and other self-loading heads.

were greater in the Middle Western States than in any of the other regions.

Trackless gathering equipment.—Sales of self-powered, rubber-tired trackless haulage units increased in 1942 over 1941. Sales were made in eight states; Pennsylvania received the largest number, and West Virginia, Kentucky, Alabama, and Ohio followed in the order named. These units, which are generally called "shuttle cars," are used to transport the coal from the mobile loader to a transfer station on the haulageway. Mobile loaders also load onto conveyors and directly into mine cars. During 1941 the initial phase of transportation of mobile loader tonnage was as follows: 86 percent by mine cars, 11 percent by rubber-tired trackless haulage units, and 3 percent by conveyors.

TABLE 4

COMPARISON OF MOBILE LOADERS, SCRAPERS, AND CONVEYORS IN ACTUAL USE IN 1941 WITH SALES REPORTED IN 1942, BY REGIONS

State and region	Mobile loaders		Scrapers		Conveyors	
	In use in 1941	Sales in 1942	In use in 1941	Sales in 1942	In use in 1941	Sales in 1942[1]
BITUMINOUS AND LIGNITE MINES						
Northern Appalachian States:						
Pennsylvania	373	116	26	2	734	191
Maryland	...	...	...	...	28	...
Ohio	122	31	...	...	153	75
Michigan	...	...	...	...	5	...
Southern Appalachian States:						
Alabama	29	32	48	4	330	100
Kentucky	142	32	...	...	284	81
Tennessee	3	...	...	...	90	23
West Virginia	464	75	5	3	1,077	485
Virginia	41	2	...	...	111	45
Middle Western States:						
Illinois	540	28	...	...	20	32
Indiana	135	13	...	...	14	2
Trans-Mississippi States[2]	136	23	30	6	749	133
Total bituminous and lignite	1,985	352	109	15	3,595	1,167
ANTHRACITE MINES						
Pennsylvania	(3)	...	[3] 505	14	[4] 2,432	324
Grand total	1,985	352	614	29	6,027	1,491

[1] Includes conveyors equipped with duckbills.
[2] Includes Arkansas, Colorado, Iowa, Montana, New Mexico, North Dakota, Oklahoma, Utah, Washington, and Wyoming.
[3] Mobile loaders included with scrapers.
[4] Includes pit-car loaders and duckbills or other self-loading conveyors.

Mechanical Cleaning of Bituminous Coal Estimated at 6,400 Tons per Hour

During 1942 installations of mechanical cleaning equipment were made in nine states. Total capacity of cleaning equipment sold for use at bituminous coal mines in 1942 is estimated at 6,400 net tons of cleaned coal per hour, as compared with 8,000 net tons capacity sold in 1941. Some of these plants will not be completed until early in 1943, but the sales were all made in 1942. In terms of additional capacity, one-half of the sales were made to mines that did not have cleaning plants and the other one-half were made as additions to equipment or replacements at mines that already had cleaning plants. The greatest capacity of sales was made in Pennsylvania, with West Virginia, Indiana, Alabama, and Illinois following in the order named.

U. S. BUREAU OF MINES

Coal cutting machine operating between two safety posts

Mechanical Cleaning of Coal Proves an Asset to the War Effort

A review of 1942 shows that the refinements developed in the preparation of bituminous coal have contributed a quality product with higher fuel value for the war industries.

By WILLIAM CHEDSEY
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THE FEVERISH WAR ACTIVITY which ushered in the year 1942 affected the bituminous coal industry, and mines everywhere contributed to a new production record. This rapid expansion in output brought on other problems; material was difficult to obtain and labor shortages developed which resulted from loss of experienced workers to military service and other war industries. Coal mining is one place where women cannot be substituted for men, nor can unskilled labor be used to replace trained workers. The coal industry, in the face of these difficulties, is certainly to be commended for having maintained high standards for quality and size preparation, especially as 1942 had the nearest approach to a "seller's market" that has occurred since 1925, and we all know that a selling market brings temptations to lower quality specifications. Maintenance of this high standard was due in part, to three things—first, a patriotic incentive to furnish to the war effort the maximum in coal quantity and quality; second, a desire to keep coal in a favorable competitive position in the fuel market; and third, an acceptance of the responsibility to reduce to a minimum the burden on the transportation system already overloaded with other materials.

The accompanying tabulation gives a summary of the development of mechanical cleaning over the past three years, and the figures for 1939-41 were taken from publications by the U. S. Bituminous Coal Commission. The 1942 tonnages were estimated from the trends of the preceding years, combined with the additional equipment sold in 1942 as given in another article in this issue of MINING CONGRESS JOURNAL.

The table is self-explanatory and needs little comment, but it might be well to call attention to the fact that column 6, which gives the "tonnage of clean coal produced," does not tell the whole story. It is seldom true that the entire product of a mine requires mechanical separation, as certain sizes may be naturally free from excessive impurities, and considering this fact, column 4, showing "tons at mines with cleaning plants," minus the reject tonnage in column 7, would really represent the actual production of high quality coal produced by the aid of mechanical cleaning.

Preparation methods are usually classified under two broad generalizations—wet washing and air cleaning. The figures in the table do not separate these tonnages, but as explained in the footnote, the proportion by the two methods has remained practically constant for 1939-41; 85 percent by wet washing and 15 percent by air cleaning. In all probability, this same proportion holds true at the present time, and wet washing has retained its popularity largely because coal as it comes from the mine, often contains so much surface moisture that dry separation, or even dry screening where close sizing is required, is not always efficient. In fact, in some cases, sprays are used on screens to get better size separation. Methods for dewatering washed coal, as well as for water clarification at cleaning plants, have received much attention and progress has been made to the point where the added water for cleaning and spraying is being taken care of by various processes of gravity or centrifugal draining and heat drying.

There were very few new technical developments for coal cleaning put into practical operation during 1942. Although scientific research continued more or less as usual, the industry was too beset by problems of production to worry about any new or improved methods that were not immediately directed toward increasing the output. There was even a tendency to slow down the rate of adding new cleaning plants, as compared to preceding years, but this undoubtedly was not due to any lack of interest in coal cleaning or lack of appreciation of its economic value, but rather to the difficulty of getting deliveries on equipment. War always stimulates scientific inventions and discoveries, and while many new discoveries will later have some application in coal cleaning, we may hardly expect these to be put into practice until the post-war period. However, there has been some research toward finding suitable substitutes for certain parts of screening and cleaning equipment that formerly used alloys of what are now critical war materials. Progress has already been made along some lines, and a special committee has been ap-

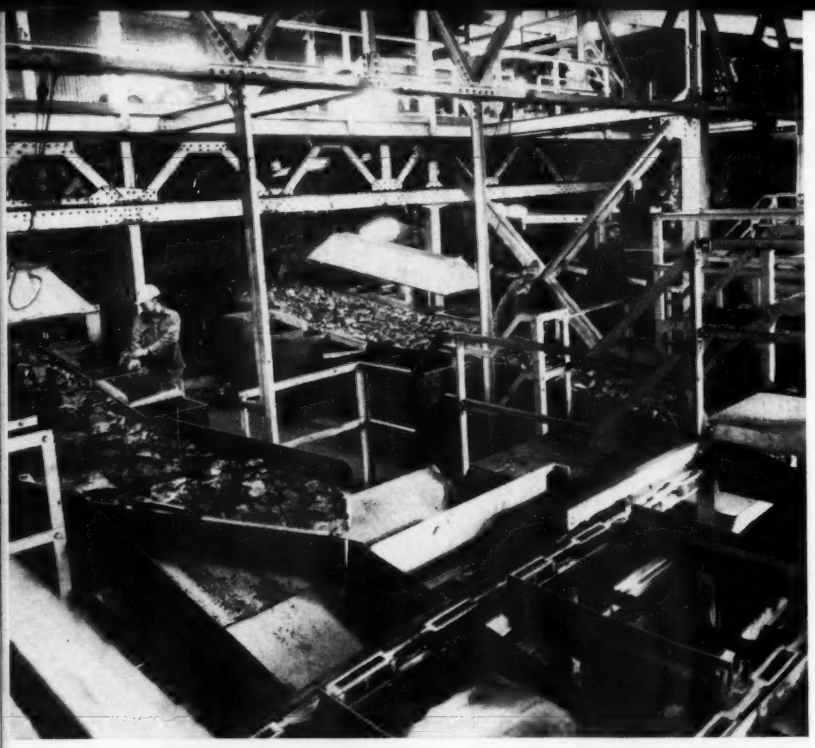
SUMMARY OF 1939-42 BITUMINOUS MECHANICAL CLEANING BY WET AND DRY METHODS (in thousands of net tons)

Compiled from statistics published by U. S. Bituminous Coal Commission

Year	Total U. S. bituminous tonnage	Percent U. S. total mechanically cleaned	Tons at mines with cleaning plants	Tons of raw coal mechanically cleaned	Tons of clean coal produced (Note A)	Tons of reject	Percent reject from raw coal
1939.....	394,855	20.1	133,260	88,816	79,376	9,440	10.6
1940.....	460,771	22.2	161,672	115,600	102,205	13,395	11.6
1941.....	514,149	22.9	185,398	133,280	117,470	15,810	11.9
1942.....	580,000	23*	200,000*	150,000*	130,000*	20,000*	...

* Estimated from private sources.

Note A—During 1939-1941, the proportion produced by wet and dry methods has remained constant at 85 percent washed, 15 percent air cleaned.



Clean coal from modern preparation plants is an asset for the war program

pointed by the Coal Division of the American Mining Congress to study this problem further.

In looking ahead, we can foresee developments in cleaning with heavy specific gravity liquids—either chemical solutions or mechanical suspension of sand or other fine particles in water that will give the effect of greater specific gravity. Some experiments already have been made, but as yet have not been developed commercially. Heavy liquids are usually expensive, and there is an appreciable loss of liquid that is carried away with the cleaned coal, and perhaps also with the refuse, which introduces a serious cost factor. In a mechanical suspension, the sand or other material involves the extra operation of washing the heavy foreign particles from the cleaned coal. All of these objections have been overcome in laboratory separations but in full size plant operation there still seems to be some practical difficulties.

With our best seams now being depleted at a high rate each year, coal conservation is beginning to have some importance and will have still greater importance in the future. Some companies have already installed cleaning equipment for recovering fuel value from the reject, and several of these operations have been described in recent issues of MINING CONGRESS JOURNAL. Conservation of transportation must also receive attention at this time, and we can realize what this means when we consider that a 1 percent reduction in ash for the entire bituminous output would mean a saving of nearly 6 million tons of freight hauled during the year. As a matter of fact, by referring back to column 7 in the table, it is estimated that there were 20 million tons of reject from cleaning plants in 1942, a large part of which would have been added to the transportation burden if the coal had been shipped as mined from the seam.

Summarizing the situation for 1942, we can say that while there have been no startling developments in coal preparation, neither have there been any backward steps. The coal industry has evidenced its desire to maintain a high quality product and mechanical cleaning has continued to operate in the same proportion and with about the same effectiveness as in previous years. All of this in spite of difficulties and handicaps due to a rapidly expanding output, as well as other difficulties of finance and labor shortage—and there is reasonable hope for future progress when the industry gets into its stride in the accelerated program. Research and investigational activities will be kept going so that new developments will be ready at the proper time to serve the consumers of coal and the industry producing it.

Tipple and washing plant of a large coal mine in Kentucky

U. S. BUREAU OF MINES

Strip Mining Stimulated By War Program

Achievements in 1942 include a new record of bituminous coal produced by the industry in spite of numerous operating difficulties. Diesel powered equipment and dragline gaining in service; operators look forward to the use of greater capacity shovels.

By WILLIAM L. BURT
Vice President and General Manager
The Jefferson Company

THE STRIPPING INDUSTRY, while figures are not yet available, closed the eventful year of 1942 with tonnage produced well ahead of 1941. Increases varied for different producing states up to a maximum of 112 percent. The average nationwide increase should be approximately 27 percent or a total of 70 million tons for the year. The table accompanying this article shows how strip mining has advanced since 1938.

It might be interesting to note here that the nation-wide increase in production for all coal mining in 1942 over the previous year was about 13 percent, or 66,000,000 tons. Of this total increase, strip mining supplied 14,928,000 or almost 23 percent. Also noteworthy is the fact that the strip pits produced approximately 27 percent more coal in 1942 than they did in 1941, while deep mines accounted for a 11 percent gain over their 1941 figures. I have emphasized these figures to indicate the steady increase and importance the stripping industry is attaining in time of war when coal is so vital to the nation, and it is reassuring to know that this type of mining has been able to increase its production by 27 percent for each of the last two consecutive years. The 1942 record is especially worthy of praise because of the operating difficulties encountered and I sincerely believe that 1943 will again show large tonnage gains over 1942.

Some of the problems this year were more difficult to cope with than in normal years. Labor conditions in the strip mining industry were for the most part unchanged except in some areas of the country where loss of men as well as absenteeism hindered production. In some locations efficiency was definitely affected because of the time required to train new men for jobs. North Dakota lignite mines, for instance, were severely affected by the draft because of the quota system originally set up in that area. Other industries took their toll of the coal industry's skilled labor, especially in the central area where expansions in war industries occurred. It would be impossible to give accurate figures on the effects of absenteeism, loss to other industries and the draft other than an estimated 10 to 20 percent loss in efficiency. One figure, however, does stand out clearly —when a man leaves the coal stripping industry he deprives the war effort of from 10 to 22 tons of coal per day, depending on the local conditions.

Accidents in strip mines for the year were average in most sections of the country. However, management is confronted with a very serious problem when the tremendous turnover in labor occurs in 1943, caused by the draft and men leaving for other industries.

A Tribute to the War Production Board

Supplies in 1942, I believe, were handled excellently by the W.P.B., considering the tremendous requirements of war industry in general. Some of us had to wait occasionally for repair parts and other necessary equipment, but for the most part the Mining Branch expedited the granting of our requests in record time. As the year advanced, so did the priority ratings, and our industry joins with others in congratulating the W.P.B. Mining Branch on a job well done.

Electric power plays just as important a part in strip mining as in deep mining and is definitely an influence on coal production. However, in 1942 the power consumption increase will not be in proportion to the tonnage increase in strip mining because a large part of our increased coal production came this year from diesel-powered equipment. The last available figures on electric power consumption are for 1939. In that year 395 million tons of bituminous coal were mined, using 2½ billion kwh., or about 6⅓ kwh. per ton. Of this tonnage, the strip mines produced 38 million, but consumed only 192 million kwh., or about 5 kwh. per ton. While no figures are as yet available for recent years, I believe because of the increased use of diesel equipment, 5 kwh. per ton will be high as an estimate for 1942. I only mention these figures to show that the 27 percent increase in strip mine tonnage in 1942 over 1941 was accomplished without drawing a proportional increase of electric power from the total war effort.

Small stripping shovels are nearly all diesel powered and, geographically speaking, nearly all strip mines in this country are located in oil-producing states where the transportation of fuel oil is no problem.

Railroads have finished their year of handling nearly all of the nation's coal tonnage without a wrinkle. Supplies of railroad cars in most localities have been ample. This is another job of cooperation very well done. For example, the coal shipments to New England alone increased 62 percent above 1941 figures. Thirteen million tons, or one-half of New England's

PRODUCTION AND ADVANCES OF COAL STRIP MINING

Year	Total Production for Country	Strip Mining Production	Percent Stripped of Total Production	Percent Annual Increase of Total Production	Percent Annual Increase of Stripping Production
1938	348,544,764	30,406,855	8.7	..	..
1939	394,855,325	37,722,583	9.6	13	24
1940	460,771,500	43,167,336	9.4	17	14
1941	514,149,000	55,072,000	10.7	11	27
1942	580,000,000 *	70,000,000 *	12.1	12	27

* Estimated.

A 30-cu-yd. bite

normal annual requirements, which prior to the war were shipped by boat from Hampton Roads, are now handled entirely by rail. The 1942 statistics for railroads are most enlightening and I would advise those who have not already done so to look them up and get a concrete example of how Americans can get things done under the most abnormal conditions. Estimates for 1943 show a large increase in requirements over the 1942 totals on coal and coke carloadings and, if the new cars on order are forthcoming, I see no reason why this increase cannot be handled smoothly along with all other shipping expansion. Without exception, all of the strip mining men I have talked with have nothing but words of praise for the railroads.

Operating Advances in Mining and Preparation Continue

The year saw minor advancements in shovel design. Manufacturers of excavating equipment had their hands too full of other business for much research, but kept a good supply of repair parts on hand most of the time. The advancement in design for greater capacity and range of new machines kept engineering departments busy putting new ideas on paper. The dragline, which has been used for stripping in the West for many years, has come to the front very prominently as a stripping tool both as an independent unit and for dual operation with stripping shovels in deep overburden. It has established itself as a rock-digging unit in the anthracite district and therefore is well worth investigating by any strip operator, even if rock digging is anticipated.

Recent developments in dragline design include the individual motorization of the hoist and drag drums, avoiding the use of clutches and brakes. Large draglines are now available with a maximum boom length of 250 ft., carrying a 14-cu.-yd. bucket. Shovels with a 180-ft. boom are also available with 25-cu.-yd. buckets.

Stripping shovels of 35-cu.-yd. capacity are now common, and it would not surprise me to see 40-cu.-yd. machines available before very long. It is interesting to note also that operators using smaller equipment have been able to draw from a vast selection of small stripping shovels, bulldozers, dirt movers, etc. This aided materially the large increase in production in 1942 over 1941 figures.

Cleaning plant construction was practically at a standstill in 1942 compared with former years. After the war, however, coal preparation is expected to constitute a major advance by stripping operators in localities where plants have not yet been installed. This will be brought about by a marked reduction in the demand for coal, which will put every strip mine on its competitive toes to do the best possible preparation job in order to stay in business. We all know that fixed prices have eliminated undercutting as a means of competition.

During the last war, many strip mines earned for themselves a bad reputation for coal preparation. In the mad dash for production, many a sulphur ball, railroad spike, or chunk of fire clay found its way into the boilers of the country. It has taken 22 years to live down that reputation and careful preparation has done the job either by cleaning plants or hand picking. Is it not worth while, then, to maintain our present standards and improve them if possible so that we may preserve the good reputation which we now enjoy?

People may believe that the land conservation programs set up voluntarily in several states by the strip mine operators will suffer during the production rush for war, but this is not the case. Forest planting was continued in the spring and fall of 1942 with the setting out of hundreds of thousands of trees. Lakes were constructed as usual and controlled game and hunting areas operated normally.

I believe it is the earnest desire of every operator connected with this constructive work to keep it going during the war no matter how busy he may be in keeping abreast of production schedules.

Strip Operators Face Many Problems in 1943

In the figures stated previously, we note that the increase in strip mine production in 1942 over 1941 was approximately 27 percent, while the drop in efficiency of labor because of draft, loss to other industry and absenteeism was between 10 and 20 percent. The question then arises, "How could this large production increase be accomplished with conditions arising such as these?" It can be answered by the fact that more men had to be hired at mines already operating, thus swelling the labor cost. Also, many new operators have come into strip mining, assisting materially in the increased output. The need for more men to maintain the same volume of tonnage would indicate a drastic cut in the number of tons per man-day, which now varies from 15 to 22 among different operations. Such a cut is evident in the last quarter of 1942 for some mines, but unless changes are made in the manpower regulations, we can look for a definite decline in tons per man-day during 1943.

Take, for example, a mine producing 4,000 tons per day on two shifts operating with a total of 200 experienced men. If it is necessary to make up a 15 percent efficiency loss by hiring 15 percent more men (inexperienced) to do the same job, we have 230 men producing the 4,000 tons and the labor cost is increased by approximately 15 percent. The tons-per-man-day figure for this mine then drops from 20 to 17.4. These calculations seem rather drastic and I only mention them here to illustrate what I believe to be the greatest problem facing strip mine operators as we enter 1943. If the nation-wide manpower shortage is as serious as it is reported to be, then shouldn't we help it by keeping our men on the job instead of increasing our personnel in order to maintain production?

Mine Operators and Manufacturers Cooperate for Better Mining

By JOHN W. HADDOCK
Vice President, Sullivan Machinery Co.
Chairman, Manufacturers Division
American Mining Congress

Problems have been common for both, but the war effort has crystallized a spirit of cooperation which assures the industry of improved and more efficient operating practices in the post-war era.

MANUFACTURERS in these times share many problems in common with mining men. They also struggle with other problems which do not confront mine operators. Similarly, there are some problems which mine operators face that manufacturers do not yet have to worry about but I am quite sure the manufacturers are content that this should continue to be the case, as few, if any, are looking for any more headaches than they already have.

For those equipped with the machine tools and facilities for metal working, which includes all manufacturers of machinery and equipment, many problems originate from having too much business rather than too little, and others come from having to answer appeals to engage in the manufacture of items partly or completely outside their range of previous experience.

When the first broad outlines of the "Defense Program" became apparent, machinery manufacturers, along with many others, were told repeatedly, and from the highest sources, that they would have to convert from their regular line of products to those required by the Army and Navy. Those serving basic industries, such as mining, found this hard to believe but found it equally difficult to get official support for their contention that they could best serve their country by continuing to serve the mining industry. Under these conditions most, if not all, became involved in some degree in military or naval work. These commitments increased rapidly in size and in extent as a result of pressures from defense, war, naval and merchant marine agencies. One of the most persuasive arguments with many was the promise that material would be made available by the armed services, while no such assurances were available for the continued manufacture even of the most essential civilian requirements.

However, the civilian demand from mines and other basic industries has continued and greatly increased, as it must if the war program is to be met. The result has been heavy backlogs of order and delayed delivery schedules, unsatisfactory both to the purchaser and the seller.

Few farsighted manufacturers view with comfort the backlogs of orders extending far into the future. Many questions are being raised as to what will happen to these when the Victory becomes assured.

With similiarly long deliveries of raw materials, supplies, etc., these manufacturers have long term purchase commitments. What will happen? Will both orders and purchase commitments be simultaneously cancelled on "Victory Day?" If not, will orders be held up, deliveries delayed and will manufacturers find themselves eventally with a substantial inventory of finished goods which they will be required to hold indefinitely? With only the average man's imagination it is quite possible, for even those normally cheerful to add wrinkles and gray hair as a result of pondering some of these questions.

Source of Materials a Wartime Problem

For most such manufacturers, the production cycle is an extended one. Inventories are normally equal to perhaps six months sales and in these days become badly out of balance. The resulting investment is large and the danger of obsolescence always increases following a period like the present in which there is emphasis on production and changes and new developments tend to be withheld. Let us assume, however, that the manufacturer has managed to keep clear of major commitments for military and naval production and that he is temperamentally able to let tomorrow's problems wait until tomorrow, and accordingly is concentrating his thought and energy on today's problem, which is production. His orders from basic industry carry what appear to be a high priority and he feels that after all he is quite fortunate as compared to the manufacturer of lawn-mowers or refrigerators who has had to go out of business or convert 100 percent to military work, and so perhaps he is. Then he finds that these supposedly high priorities are not good enough to get the material he needs when it is needed, and sometimes not at all, for most such manufacturers use a wide variety of materials and relatively small quantities of each as compared to plants turning out tanks or aeroplane engines, and the mills are just too busy to be much interested in producing the few tons of some particular shape or alloy. They are, of course, also too busy to let him know of the delay until he calls them to find out why the material wasn't shipped as promised.

Being so completely occupied with their other business, they are also too busy to make any new promises and simply say they will get to it when they can, if they can, and so the manufacturer frantically seeks other sources of supply, or similar quantities which may be in another manufacturer's stock or warehouse, or anything that can be made to substitute often without regard to the expense of securing it or cost of fabricating it.

With perhaps 8-in. round stock where 4-in. square was called for, which has to be turned down and then milled on all four sides, the manufacturer settles back only to find that his lathe hand has gone off to take a job in some "War Baby" plant at much higher rates and the milling machine operator has been put in 1-A and is to be inducted on Thursday. Sometimes there are others to be had but more often there are none. Experience has proved that the best material may be farm boys who are completely without training or experience, but who are

interested and can be taught. The worst are floaters, fly-by-nights, drinkers and the like. Where such losses are most keenly felt are, of course, in supervising personnel, inspectors and others where much experience and training is required.

Few men not experienced in machine shop work can appreciate the great difference in the amount of skill required between those men producing various general purpose machine tools in relatively small quantities compared to men employed in high production plants on repetitive work which permits of special purpose machine tools and carefully engineered jigs and fixtures. In most plants of the latter type, the majority of employes are operators who start and stop the machines and handle the material having little or no influence upon the quality, which is controlled automatically by the setting of machines and the tooling with which they are supplied.

Continuous training and upgrading are the obvious answers but it is difficult to develop in a few months the skill resulting from an apprentice course extending over a period of years.

No Lifting of Price Ceilings for Manufacturers

Manufacturers have long since reconciled themselves to limited profits for the duration. Few, if any, would knowingly place themselves in the position of the profiteers of the last war even had they the opportunity, but it has been evident for many months that price ceilings would be imposed and were not likely to be readily lifted. This has been confirmed by the experience of our friends in the mining industry who have endeavored to respond to Washington's appeals to increase overall production by high cost operations such as mining marginal ores. Manufacturers have had substantial increases in costs, principally labor costs without, as far as the writer knows, any lifting of price ceilings. These increases came both from higher rates and less efficient workmen. In some degree, increased volume of operations has offset these but for most the point of diminishing returns from this source has been reached.

Renegotiations of price on war contracts is one major hazard which the mining industry so far has been fortunately and properly spared. For manufactures it is triple-barreled. First, it takes a terrific amount of time and effort on the part of badly overloaded executives and key men. Secondly, until such a renegotiation is completed there is no way of foretelling what the results will be, and accordingly the manufacturer's financial statements are subject to question. Thirdly, there seems a probability that some part of any profit he may have on his books will be recaptured. So far, few satisfactory definitions are available. For example, what is "War Business?" This started out as direct contracts from the army, navy and maritime commission but is being extended to cover sub-contracts, sub-subcontracts and even further.

Finally, of course, there is the problem common to all business men, and to most of us as individuals, of bringing out of our businesses cash adequate to meet the Federal income taxes imposed. With increasing investments in inventory and receivables, this last may be a difficult achievement for many and few will feel happy about borrowing money to pay taxes.

Thus, the average manufacturer doesn't think he is very likely to be in the "profiteer" class. On the contrary, most are primarily concerned with maintaining the solvency of the business for which they are responsible.

This they are determined to do. They feel a strong obligation to their customers, their employes and their stockholders. It has been common to speak of these as being the three groups each business endeavors to serve. Of the three I think the obligation to those who purchase clearly comes first for the obligations to employes and stockholders can only be met if those who buy are well served.

The group of manufacturers serving the mining industry can, I believe, take justifiable pride in the service they have and are rendering to the mining industry. Great advances have been made over a period of relatively few years, as, for example, between the period of World War I and World War II. Perhaps the best measure is output per man hour, or man day which has increased tremendously in nearly every type of mining operation. In general, I think it may be said this is the result of an increased mechanization developed jointly by mine operators and mining engineers working with machinery manufacturers. Together they constitute a team which has and is successfully meeting every challenge. Manufacturers are proud to be on this team with mining men.

New Designs Cost Much and Outcome Uncertain

Few know, and only those directly responsible for the expenditures really appreciate the cost of developing new and improved equipment. The cost is high both in effort and money. Devices that appear relatively simple once they are perfected often involved problems which to solve required months or years of work and many thousands of dollars.

As the cost is high, the outcome is uncertain. Anyone with experience in the industry need only look back over a period of years to recall examples of failure even when those working on the problem were thoroughly experienced and capable, and invested much time, effort and money. Every worthwhile manufacturer feels the desire to advance the art. A substantial part of his profits are reinvested in engineering and development work with the foreknowledge that some part of this will prove to have been wasted. The degree of risk varies, of course, with the nature of the development and of the size and financial strength of the manufacturer—but risk there is, and yet, if the manufacturer does not accept this and do such pioneering he will find his business going backwards. The manufacturer who does make substantial expenditures of this kind can, with a clear conscience, ask his customers to pay a price which includes a reasonable profit both to return expenditures already made and to provide the resources for further development work.

Manufacturers' Engineers Have Contributed Much to Mining Industry

It is obviously extremely difficult to keep developments moving forward during war time. In general, government policies must be to make the best use of what we have, and materials, brains and labor are not easily spared. However, more progressive and farsighted manufacturers are struggling to keep new developments under way, particularly where there is a prospect that if successful they can be used to advantage during the war period.

Manufacturers generally accept as their first duty in these times that of assisting users to get the maximum out of present equipment. This calls for constant work on the part of field engineers, servicemen and others in the training of miners and maintenance men and in supplementing both when greater knowledge of the equipment is involved. I believe it is safe to say that all the experienced manufacturers' field men could be fully employed were there no new machinery being manufactured, sold and installed. Instances are common in which manufacturers' field engineers have contributed greatly to speeding up mining operations and reducing costs even though no new equipment was directly involved and no immediate sales promoted. This is as it should be, and over a period of time may be considered the soundest kind of salesmanship.

Manufacturers hope and expect by better serving the mining industry to make their major contribution to the winning of the war and, while this must be the major concern of all of us, the mining industry may also feel confident that when the post-war period brings its problems that the manufacturers will be found ready to work on these and to assist in their solution.

Federal Coal Mine Inspection Has Its First Anniversary*

A review of the procedure and work done by experienced mining men and engineers who are employed by the Government as coal mine safety inspectors

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THE FEDERAL Coal-Mine Inspection Act of May 7, 1941, authorizes the Secretary of the Interior, through the Bureau of Mines, to enter coal mines to make or cause to be made annual or necessary inspections and investigations for various purposes, chiefly in connection with obtaining information pertaining to health and safety conditions, including the causes of accidents or ill health. The Act lists several purposes for which the data so obtained are to be used, among them annual reports to Congress, the publication of reports compiled from the inspections and investigations, and the compilation of statistics and their publication. It specifically states that this inspection and investigation work shall be done by employes of the Bureau of Mines and that they shall cooperate with other bureaus of the Interior Department, as well as with the official mine-inspection or safety or health agencies of the several States and territories.

The Coal-Mine Inspection Act also provides for establishment of an advisory committee of not more than six and authorizes appointment (subject to civil service laws) of employes deemed necessary to administer it, to fix their compensation subject to the Classifications Act of 1923, as amended, and to prescribe the powers, duties, and responsibilities of those engaged in its administration. The Act specifies that persons selected as coal-mine inspectors shall have the basic qualification of at least five years' practical experience in mining coal and be recognized by the Bureau of Mines as having the training or experience of practical mining engineers in those essentials for competent coal-mine inspection. In detailing coal-mine inspectors to the inspection and investigation of individual mines, due consideration is to be given to their previous practical experience in the work of mining coal in the State, district, or region where such inspections are to be made.

No provision for funds was included in the original legislation, except that it "authorized to be appropriated, out of any moneys in the Treasury not otherwise appropriated, such sums as may be necessary for the due execution of this Act."

All Required Personnel Not Yet Chosen

On May 21, 1941, the United States Department of the Interior submitted to the Bureau of the Budget detailed estimates for administration of the Act. The Budget Bureau, in turn, authorized placing before Congress a request for $729,000, approximately 60 percent of the original sum requested; this entire amount was allowed by Congress and was available for the fiscal year ended June 30, 1942. Table I gives a breakdown of the 11 units into which the allotment for the first fiscal year was divided with the personnel in each.

The funds for the fiscal year ended June 30, 1942, were given on a nine-month basis for all units except the following: No. 4, Mine Inspection Division Headquarters (Washington, D. C.); No. 7, testing of electrical machinery (Pittsburgh, Pa.); No. 9, Coal-mine accident statistics (Washington, D. C.); No. 10, additional work in the administrative Branch (Washington, D. C.); No. 11, Printing, binding, etc.; these allotments were allowed on a full 12-month basis. The units under the nine-month allotments were expected to get under way not much earlier than October 1, 1941, hence the nine-month limitation of funds.

As previously indicated, the Federal Coal-Mine Inspection Act became effective July 1, 1941, inasmuch as some funds were made available at that time; however, most of the funds allotted for the fiscal year 1942 were available on only a nine-month basis, hence relatively few of the personnel were chosen until after October 1, 1941, and not all of the personnel have been chosen at this date, although the full quota of 107 inspectors and 10 engineers is practically completed. A new division (coal-mine inspection) was created in the Health and Safety Service and constituted the third one in that service; two additional divisions were created later, during the first half of 1942.

The mine-inspection setup included 26 assistant inspectors at $2,600 a year, 33 associate inspectors at $3,200, 33 full-grade inspectors at $3,800, and 15 senior inspectors at $4,600, all in the field, and 14 clerks were assigned to do the field clerical work. The authorized supervisory force consisted of a chief inspector and an engineer assistant, two clerks in the Washington office, and an engineer and two clerks also assigned to the office of the Chief of the Health and Safety Service.

Adequate provision was made for expansion of laboratory work of various kinds, such as gas and dust analyzing, testing of electrical equipment, etc., all at Pittsburgh, Pa., and for corresponding increase in personnel; and funds were allotted to Washington, D. C., for an information unit, for statistical work, and for handling administrative work such as bookkeeping, auditing, etc. The total number of employes aggregated 190 persons and, as stated, the allotment funds for the first fiscal year were $729,000; funds for the second or present fiscal year, 1943, were also $729,000.

All members of the personnel were chosen under strict civil service procedure, and more than 2,000 persons took the civil service examination for the various grades of mine inspector; the examination is a continuing one,

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and any interested persons can still take the examination by applying to the Civil Service Commission. In choosing the personnel for the inspector positions utmost care has been taken to select those thoroughly qualified by experience in coal mining and in the best physical condition; the latter qualification is of especial importance because the mine inspector who does a really good job must at all times be physically fit and have endurance far beyond that required for most other occupations, not only for routine inspection work but also for emergency work, such as at explosions or fires.

As the inspectors were employed, they were assembled at the Central Experimental Station of the Bureau of Mines, Pittsburgh, Pa., and given intensive instruction in the fundamentals of mine safety as embodied in the information assembled by the Bureau of Mines through experiments, observation, and experience over its 32 years of existence. The classes each comprised approximately 40 persons (inspectors and engineers employed under the Inspection Act), and lectures and demonstrations were given by experienced instructors, most of whom had had more than 15 years (and several of them more than 25 years) of experience in safety work in the service of the Bureau of Mines. The instruction covered practically every phase of accident prevention taught by the Bureau of Mines. Special attention was given to technical subjects, such as gas and dust sampling and analysis, testing of explosives and of electrical equipment, formulation of reports, etc.; this last part of the instruction course was particularly important, inasmuch as the inspections and inspection reports are largely technical.

Relatively few of the new inspectors are technically educated, hence considerable care has been taken to inform the new personnel of the correct way not only to make the inspections but also to write reports; the latter is of greatest importance, because the Coal-Mine Inspection Act requires that reports made under it must be published. As practically all phases of mine-inspection work that deal with accident prevention (especially the recommendations and conclusions) almost inevitably and entirely discuss controversial matters, the reports must be written with utmost care and accuracy. The importance of care in report writing is evident when it is realized that as the coal-mine inspection work gets well under way approximately 2,000 of these reports probably will be made a year, every one containing numerous recommendations (20 to 50 or more); on practically every one of these there are almost sure to be differences of opinion between the inspector and the mine personnel, including both workers and officials.

Inspectors Use Latest Safety Equipment

As part of the preliminary instruction work, every one of the 107 new inspectors and the 10 engineers participated in one or more actual mine inspections, accompanied by an experienced Bureau of Mines engineer or inspector, and the *"student"* inspector either made the report or participated actively in making it.

After the training period of more than a month at Pittsburgh was completed, the new inspectors were assigned to work under the supervision of the experienced Safety Division supervising engineers of the eight districts into which the Health and Safety Service has divided the United States (see map, Fig. 1); all of these supervising engineers have been employed in safety work for the Bureau of Mines 15 or more years and their districts include all of the coal mines of the United States. It is hoped that ultimately every important coal mine in the United States and many of the less important mines can be inspected by the Bureau, resulting in reports that contain essential facts as to conditions affecting safety.

The 107 inspectors and 10 engineers take turns in using 90 automobiles; the men are also equipped with up-to-date safety equipment and devices, such as flame and electric safety lamps, methane detectors, psychrometers, anemometers, barometers and gas-and-dust-sampling equipment. They have also been furnished with a complete outline on making mine inspections and an equally complete set of coal-mine safety standards; the latter were prepared by a committee composed of the most experienced safety engineers of the Bureau of Mines, and although months of careful work were devoted to them, these tentative standards are subject to revision as changing conditions in coal-mining procedures appear to make alterations necessary.

The reports are typed at the office of the supervising engineer of the district in which the inspectors work, allowing the inspectors to have the advantage of the advice and constructive criticism of the supervising engineer in the phrasing of their reports.

Two types of reports are made at present. A concise, greatly abridged report is completed within a few days after the inspection is completed; this is typed and posted at the mine. The complete report is formulated after the results of the analytical work on gas, dust, and other samples, etc., have been received from the Pittsburgh (Pa.) laboratories, and this finished report, after approval by the supervising engineer of the district, is transmitted to Washington, D. C., where it is again carefully reviewed and suitable alterations are made. It is then transmitted by the Director of the Bureau of Mines to the mine operator, the miners' union, the State inspectors and the supervising engineer's office, and two copies are retained at the Washington office of the Bureau of Mines. These typed copies of the final report (usually of 25 or more typed pages) are held open for public reading at the office of the supervising engineer of the Bureau of Mines district in which the mine is located and at the Washington office of the Bureau of Mines.

The inspection force of the Bureau of Mines consists mainly of men fresh from operating and engineering departments of coal companies; some

TABLE I

COAL MINE INSPECTIONS AND INVESTIGATIONS, BUREAU OF MINES

		Inspectors and engineers, health and safety service	Research workers, health and safety service	Research workers, technologic service	Statisticians, economics service	Administration and information, Washington, D. C.
1. Inspection service (field) (9 mos.)	$498,935	121	..	..	..	..
2. Investigations on electricity and explosives in coal mines (field) (9 mos.)	44,160	10	..	..	..	..
3. Occupational disease investigations (field) (9 mos.)	24,650	...	6	..	..	..
4. Mine Inspection Division headquarters (Washington, D. C.) (12 mos.)	24,110	7	..	..	..	..
5. Information unit (Washington, D. C.) (9 mos.)	26,885	...	..	..	..	9
6. Gas and dust laboratory analytical work (Pittsburgh, Pa.) (9 mos.)	29,445	...	14	..	..	..
7. Testing of electrical machinery (Pittsburgh, Pa.) (12 mos.)	8,420	...	..	3	..	..
8. Coal-analysis work (Pittsburgh, Pa.) (9 mos.)	12,765	...	..	6	..	..
9. Coal-mine accident statistics (Washington, D. C.) (12 mos.)	20,000	...	..	..	7	..
10. Additional work in the Administrative Branch (Washington, D. C.) (12 mos.)	14,630	...	..	..	..	7
11. Printing, binding, etc.	25,000	...	..	..	..	..
Total estimate of appropriation for 1942	$729,000	138	20	9	7	16

Fig. 1. Map of the United States showing general headquarters, field headquarter districts, district and sub-district headquarters, location of mine safety stations and field offices, and headquarters of mine safety cars, safety and inspection divisions, health and safety service of the Bureau of Mines

have been State mine inspectors, and all have had five years or more of underground experience, and generally mining experience exceeds 10 years. Those who have been underground operating officials have, in such positions, been familiar with measures required for daily compliance with State mine-safety laws or orders and company safety rules, as well as guiding efficient coal production. Those who have worked in engineering positions have been required to be familiar with mine operating conditions and procedures, and moreover they have been concerned with mine layouts and with the selection, installation, and operation of equipment that would give efficient and safe production. In short, all of the new inspectors have had practical experience in the daily scrutiny and study of mine conditions, practices, and equipment in their relation to safe and efficient mine operation.

The essential purpose of the Federal Inspection Act and therefore of the inspections, is to secure greater safety and health for workers in and about the coal mines of the United States. So far as the individual mine inspected is concerned, the procedure followed to achieve these results consists of a thorough inspection, discussion of mine conditions and practices with officials that accompany the inspector during the inspection, discussion with officials (immediately after inspection) of conditions found and recommendations to be made, the posting immediately after an inspection of a preliminary report of conditions found, and subsequently the preparation of a detailed report on the inspection. A copy of the preliminary report is furnished to the State Mine-Inspection Department, and one is also posted at the mine as above indicated; copies of the final detailed report are supplied to the operator, to the national and State miners' organization representing the miners in the particular mine inspected, and to the State Mine-Inspection Department. The final report is also available for examination by the public at the Washington office of the Bureau of Mines, United States Department of the Interior, and in the district office of the Bureau to which the inspector reports. The Washington office of the Bureau also prepares press releases based on final reports of inspection; these press releases are sent to newspapers published in the vicinity of the mine inspected. Inspection procedure by Federal mine inspectors is essentially as follows:

The company mine office usually is visited the day before underground inspection is begun; arrangements are made for the underground inspection; the mine map is examined and arrangements made to procure a copy of it, if one is available; the fireboss' book or the mine foreman's book is examined; and the surface plant is at least partly inspected. Filling out the comprehensive set of notes required as part of the inspection is usually started on the first day, and the inspector must record these notes. Available accident records are examined to enable the inspector to know whether any types of accidents are unduly frequent, so that, in his underground work, he may ascertain the causes of such accidents as well as possible procedure to try to avoid them.

Good Safety Practices by Management Lauded

Federal mine inspectors are directed to conduct inspections in such manner as to gain and retain respect and confidence from management, employes, and the public. Their reports include observations on good practices used in the mine inspected and recognize good safety records, safe equipment, and efficient safety organization; in their reports they also take full cognizance of unsafe and dangerous practices, conditions and equipment. They take especial measures to discuss at once with man-

agement and the representative of the State Inspection Department any dangerous conditions that immediately imperil any considerable number of men.

They spend enough time in and about a mine to ascertain the important facts regarding safety in that mine; the length of time required to inspect a mine may vary from a day or a few days for a small mine to as much as six weeks in a relatively extensive mine operating on a steep pitch or having extensive workings, or employing large numbers of men. Over a three-month period the time of inspection has averaged 9.4 days per mine. Where special problems arise in the course of an inspection, the explosives and electrical engineers employed by the Inspection Division and the engineers of the Safety Division are available for further study and solution of such problems.

Stated Opinions Must Be Well-Reasoned and Constructive

Inspectors are instructed not to be quick to condemn either mine officials or miners for some substandard or dangerous condition or practice found; years of experience by Bureau of Mines safety workers prove that best results from inspections are likely to be obtained by cooperating with rather than antagonizing mine personnel. Experience also indicates that the capability of a mine official or miner seldom can be judged fairly after only one visit to the mine or mine working place—bad conditions may be due to circumstances beyond his control; and good conditions may, on the other hand, be due mainly to nature or to the capable work of someone who preceded him. The inspector principally observes conditions, practices, and equipment and mainly reports ascertained facts; and opinions stated in reports are supposed to be well-reasoned and constructive.

Inspections are usually made in company with a mine official, preferably the mine foreman or superintendent if he can spare time from his duties, and questions that arise in the course of the inspection are discussed immediately with this official. The responsible underground officials are the men who are directly safeguarding the mine employes through their daily work; they are the men through whom many of the Bureau safety recommendations can be put into effect, hence it is decidedly important to discuss matters with them and to cooperate with them.

Possible fire hazards, electrical contact hazards, and explosives storage hazards are among the more important surface features to be examined. Usually the surface fan or fans are visited before the mine is entered, and often the total air circulated by the fan is measured in connection with the visit to the fan.

In underground inspection the following points are emphasized:

The inspector rides on the man-trip—if there is one—both into and out of the mine, as it is known that many accidents are caused by careless practices or hazardous conditions associated with man-trips.

Time is spent with the night-shift boss and the fire boss, as this is likely to be informative regarding night operating practices and supervision and thoroughness of gas examinations. The inspectors observe timbering practices and roof-testing and roof-control methods in detail; moreover, they pay close attention to loose or dangerous roof, bearing in mind that roof, rib, and face falls are the most prolific cause of underground coal-mine accidents, fatal as well as nonfatal.

Haulage equipment, practices, clearance, and conditions are closely scrutinized because it is well-known that haulage accidents are the second largest cause of coal-mine fatalities as well as a prolific cause of nonfatal accidents, many of which are decidedly serious. Considerable time is given to studying operation of mechanical equipment and possible hazards in connection therewith, inasmuch as there is good reason to believe that mechanized mining is responsible for more than its proportionate share of both fatal and nonfatal accidents in present-day coal mining; and unless the various problems associated with accidents due to mechanized mining are worked out and the hazard overcome, accident rates are likely to increase.

The inspectors are instructed to visit all working places and to examine accessible old workings; they travel the main as well as the return aircourses in the various splits sufficiently to determine conditions as to obstructions and general adequacy.

Electrical Installations in Remote Places are Checked

Inspectors must procure full information on the underground electrical system and observe possible fire, explosion, and man-contact hazards from electrical installations; especially should they look for electrical hazards in remote places in the mine, such as a small gathering pump with wiring in contact with coal or timber or power lines carrying current in nonworking parts of the mine. A conscientious inspector must examine thoroughly gas conditions in representative working places, in returns, at and on caves, in open nonoperating entries and rooms, and adjacent to and in air from sealed areas, using either the electrical methane detector or the flame safety lamp, or preferably both of them; flame safety lamp and other detector tests are supplemented with a dozen or more samples of mine air taken with vacuum bottles. These air samples are taken in duplicate in the main return and in the returns from important splits, and some samples are taken in working places and at or on caves. The mine-air circulation is or should be measured in the main return or returns, in the main intake or intakes, and in or adjacent to the last open crosscut in mine-air splits and also near the mouth of each split.

Dust Explosion Hazard Carefully Studied

The coal-dust hazard is studied with care, and accumulations of coal dust on crossbars, on ledges of the rib, and on roadways are carefully observed and noted. Even when the roadway is wet, the ribs and timbers may contain enough dry dust to create a definite explosion hazard. If the mine is rock-dusted, an examination is made to see whether a thin veneer of rock dust may not conceal dangerous coal dust or whether the rock dust may be overlaid by dangerous amounts of fine, deposited coal dust. From 10 to 20 sets of dust samples from road and rib are collected at approximately 1,000- to 1,500-ft. intervals on entries and air courses and in rooms, and at the same time visual observations and notes are made to insure that in future inspections the incombustible content of the dust on surfaces can be at least partly estimated. If the mine has not been rock-dusted and is obviously dangerously dusty and dry, a few samples serve the purpose to determine the dust hazard.

Those in charge of this Federal inspection work recognize the fact that the Act was passed due to the same actuating motive as the original formation of the Bureau of Mines, namely, as the result of mine disasters involving large loss of life in individual mines. Moreover, even though it is well-known that fatalities from falls of roof and haulage accidents in the aggregate total many more annually than do those from explosions and other disasters, a single disaster may wipe out all of the lives of workers in an individual mine, cause distress and impoverishment to an entire mining community, wreck a mining company financially, and give a "black eye" to the whole coal industry; most important, however, is the fact that the lives of workers and production essential to waging war may be lost. Therefore, in mines with coal-dust explosion hazards—in general, all coal mines except anthracite—the inspection covers the dust—explosibility hazards fully, and judgments are formed and recommendations made as to the immediate measures, if any, necessary to minimize such hazards; and the possibility of gas explosions and methods of preventing such explosions are stressed in practically all coal mines.

Matters pertaining to explosive and blasting are given very careful study because blasting accidents are almost certain to be ultraserious and many of them precipitate major disasters. The information obtained from the Federal coal-mine inspectors' reports is of much value in aiding in the administration and enforcement of the Federal Explosives Act.

Other serious hazards inherent in the mine conditions and surroundings must be carefully considered; for example, sealed fire regions or those containing blackdamp, overlying water--filled strata, or water and gases in immediately adjacent abandoned or operating mines; the mine map is usually studied carefully to ascertain the possible existence of out of the ordinary hazards.

The effect of any new activity as far-reaching as this cannot be gaged adequately by one year's work, but "straws show the way the wind blows" and at least this can be said: Whether the new Federal Coal-Mine Inspection activities did or did not have a vital influence on the coal-mine safety record for 1942 is problematical, but it is significant that while industrial work in general had a sharp increase (18 to 25 per cent) in the accident rate, tentative figures show that the year 1942 gave to coal mining its best or lowest fatal accident rate per million tons of coal produced (2.330 tentative) in the history of the industry, except the year 1941 when the rate was 2.237 (final). This very excellent record was established by an industry sorely beset by essentially all of the industrial and other ills of a war year and in connection with a production expansion from 565,405,000 tons in 1941 to an estimated 635,956,000 tons in 1942; this output was exceeded by that of only 5 years in the history of the United States (1917, 1918, 1920, 1923 and 1926).

TABLE II

Coal Mining Fatalities and Fatality Rates and Tonnage, 1931–42, Inclusive

Year	Number of fatalities (anthracite plus bituminous)	Deaths per million tons of coal produced	Tonnage (anthracite plus bituminous)
1931	1,463	3.31	441,750,978
1932	1,207	3.36	359,565,093
1933	1,064	2.78	383,171,877
1934	1,222	2.93	416,536,313
1935	1,242	2.925	424,632,005
1936	1,342	2.73	491,138,762
1937	1,413	2.83	498,792,928
1938	1,105	2.79	395,696,632
1939	1,078	2.41	447,976,639
1940	1,388	2.71	512,808,119
1941	1,265	2.237	565,405,000
1942	1,482[1]	2.330[1]	635,956,000[1]

[1] Tentative, as estimated 1943, by W. W. Adams, Employment Statistics Section, Bureau of Mines. These figures are likely to vary but slightly from the final figures, which will not be available for several months.

Table 2 shows the rapid increase in production during the past 3 years compared with other years of the last decade and also the slow but steady decline in the fatality rate per million tons of coal produced, the rate (tentative) in 1942 being much lower than any other year in this decade (or of any other decade) except 1941; the 1942 rate (tentative), however, is but little below that of 1939, and the final figure (not available for some months) may be little if any below the 1939 rate of 2.41.

Figure 2 shows the slow, steady lowering of the accident rate in both anthracite and bituminous mining, with a very slight recession in 1942 in bituminous mining compared with the banner year of 1941 and a slightly greater recession in anthracite mining in 1942 compared with both 1940 and 1941.

Table 3 gives the details of the *tentative* number of fatalities and fatality rates per million tons of coal (anthracite and bituminous) by causes. Explosions (major and local) of gas and dust caused 144 fatalities in 1942 with a fatality rate of 0.239; the similar figures for 1941 were 88 and 0.174. It is significant that if the fatalities from explosions of gas and dust were as low in 1942 as they were in 1941, the fatal accident rate (tentative) in 1942 would have been almost identical with that of 1941.

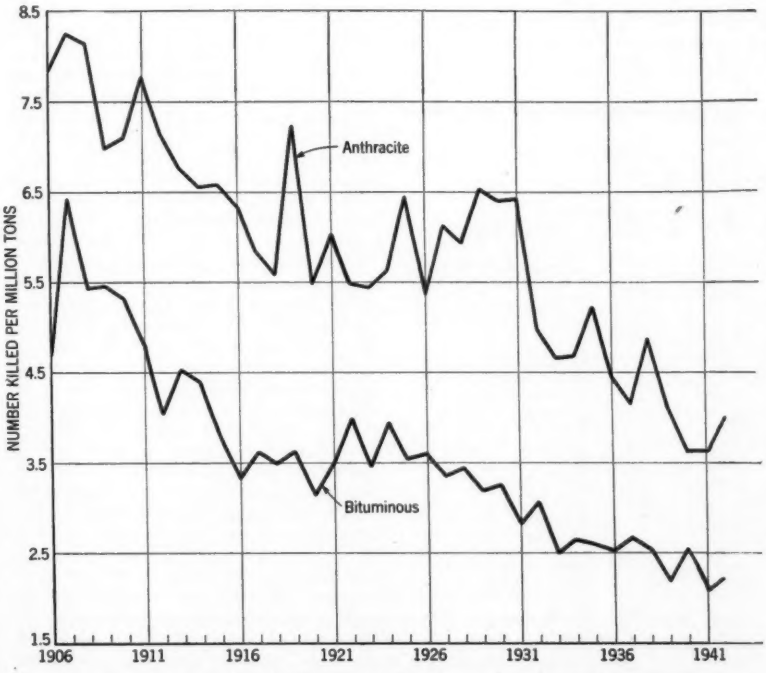

Fig. 2. Number of men killed per million tons of coal mined—all causes. Bituminous and anthracite mines

Federal Mine Inspection Frequently Criticized

One of the most frequently voiced criticisms of Federal Coal-Mine Inspection is that it duplicates effort, inasmuch as nearly all of the coal-producing states have their own inspection activities. This argument would be much more potent if the mining accident rate had been brought into line with that of other major industrial activities in the United States. Table 4 (published by the National Safety Council), giving the accident frequency and severity rates of 31 major industries, places mining as having an accident frequency rate more than double that of the average of the 31 and an accident-severity rate 6 times as great as that of the average of the 31. Moreover, mining ranks next to the worst of the 31 in frequency and as the worst by far in severity. The table does not state that coal-mining rates are fully as bad as those of metal mining, but it is a fact (and in some years the coal-

mining accident rates are worse than those of metal-mining), hence it appears that far more work should be done toward trying to bring accident rates in mining (coal as well as noncoal) within the range of the rates of comparable industrial work in this country. To those who counter with the claim that mining is ultrahazardous work, the obvious answer is that while the statement certainly is true, on the other hand, numerous mining companies having well-systematized, consistent accident precautionary procedures also have accident rates well within the average rates of the main industries of the United States as given in table 4. Thus they prove that *"it can be done,"* and the obvious conclusion is inescapable that the reason it is not done on a nation-wide basis is that sufficient effort of the right kind has not been exerted.

TABLE III

NUMBER OF COAL MINE FATALITIES IN THE UNITED STATES DURING 1942 [1]

Cause	Bituminous A	Bituminous B	Pa. anthracite A	Pa. anthracite B	Total A	Total B
UNDERGROUND						
Falls of roof and coal	626	1.083	136	2.358	762	1.198
Haulage	256	.443	37	.641	293	.461
Explosions: Major	127	.220	...	...	127	.200
Local	17	.029	8	.139	25	.039
Explosives	20	.034	13	.225	33	.052
Electricity	52	.090	5	.087	57	.089
Machinery	46	.079	1	.017	47	.074
Others	34	.059	11	.191	45	.071
Total	1,178	2.037	211	3.658	1,389	2.184
SHAFT	5	.009	2	.034	7	.011
OPEN PIT	21	.036	5	.087	26	.041
SURFACE	50	.087	10	.173	60	.094
Grand total, 1942	1,254	2.169	228	3.952	1,482	2.330
Total previous year	1,071	2.095	194	3.585	1,265	2.237
Production, tons (est.)	578,269,000		57,687,000		635,956,000	
Production previous year	511,290,000		54,114,961		565,405,000	

[1] Estimate from tentative reports for January to November.
A, number of fatalities; B, rate per million tons of coal mined.
The above tabulation was supplied by W. W. Adams, Employment Statistics Section, Economics and Statistics Service, Bureau of Mines.

Thousands of Recommendations Put Into Effect

That Federal coal-mine inspection to date is being accorded a considerable degree of support and cooperation is amply evidenced by scores of letters from mine operators, as well as mine workers and their representatives, commending the work; many of these letters come from operating men who had been definitely opposed to the idea of Federal coal-mine inspection before the Act was passed by Congress. The number of outspoken criticisms in published or typed form that have been received is remarkably few, and while this does not prove that the work is universally popular, it certainly indicates that opponents have not as yet pointed out many, if any, serious defects.

Up to the present time (January 1, 1943) somewhat fewer than 1,000 reports have been made, and several thousand of the recommendations that have been embodied in the reports have been put into effect by the mining companies. The response to the work has been far more favorable than even the most rabid proponent had any right to expect; hundreds of the changes that have been made in mines in consequence of the recommendations contained in the relatively few reports completed to date are of a major nature, and they have been made in improving ventilation, haulage, roof control, dust reduction or control, safeguarding electricity and electrically operated equipment, eliminating or at least mitigating water hazards, improving explosives storage, transportation and use, etc., etc. Ordinarily, state mine inspectors find that the work of the Federal inspectors supplements rather than crosses their efforts, and generally the state inspector takes immediate steps to see that violations of state laws mentioned in the Federal inspection reports are remedied without delay and tries to aid in putting into effect recommendations that state law does not cover.

TABLE IV

UNITED STATES INDUSTRIAL ACCIDENT FREQUENCY AND SEVERITY RATES
From National Safety Council

FREQUENCY Disabling injuries per 1,000,000 man-hours		SEVERITY Days lost per 1,000 man-hours	
Tobacco	3.23	0.20	Tobacco
Cement	5.99	.30	Aeronautics
Steel	7.02	.35	Printing and publishing
Glass	7.37	.50	Glass
Aeronautics	7.40	.53	Textile
Automobile	7.49	.62	Rubber
Rubber	8.10	.64	Automobile
Chemical	9.48	.79	Machinery
Laundry	9.79	.82	Tanning and leather
Printing and publishing	9.87	.83	Sheet metal
Textile	10.23	1.04	Woodworking
Machinery	10.66	1.15	Laundry
Petroleum	11.78	1.16	Transit
Public utility	12.70	1.30	Food
Non-ferrous metals	13.17	1.30	Chemical
Sheet metal	14.37	1.30	Metal products
Transit	14.99	1.33	Clay products
All industries	15.39	1.33	Foundry
Meat packing	15.70	1.42	Meat packing
Tanning and leather	15.88	1.44	Petroleum
Food	16.16	1.53	All industries
Metal products	16.61	1.61	Marine
Paper and pulp	17.37	1.63	Non-ferrous metals
Quarry	17.96	1.66	Public utility
Foundry	21.27	1.66	Paper and pulp
Woodworking	22.44	1.75	Steel
Marine	22.82	1.92	Refrigeration
Construction	27.11	2.22	Cement
Clay products	30.82	2.42	Construction
Refrigeration	37.59	3.71	Quarry
Mining	38.90	5.19	Lumbering
Lumbering	52.45	9.42	Mining

Cooperation by Coal Mining Industry is Gratifying

Although the idea of Federal mine inspection was very definitely disliked by many if not most mine operators and state mine inspectors before the passage of the present Act, its actual administration has met essentially no opposition to date, though unquestionably many mining people still resent the intrusion of the Federal Government in this type of activity. The cooperation afforded by workers, operating officials, state mine inspectors, and others concerned with the operation of the coal mines of the United States has been decidedly gratifying, indicating that the new procedure is to be afforded a fair try-out to ascertain whether it is actually workable and whether it can give the service and achieve the results its proponents expected and predicted. The work to date has been done with a view to trying to obtain and retain the cooperation of all engaged in coal-mining activities in a concerted movement toward diminishing of the admittedly high rate of accident occurence in the coal mines of the United States. That this is no easy task is recognized by any one at all familiar with coal mining and its hazards; that it can be done is now apparent, even though the new type of work has really been under way only a comparatively few months and all of the field men are new to it.

The Tax Picture—Present and Future

Additional revenue from war needs obtainable only from lower income brackets. Healthy industrial system in future depends on intelligent tax policy.

By HENRY B. FERNALD
Loomis, Suffern and Fernald
New York, N. Y.

THE Tax Picture, Present and Future, of the mining industry requires consideration of the present over-all picture of our Government expenditures and the problem of raising from revenues and borrowings the needed funds to meet them. Then we can look somewhat at the future for the remaining years of the war period and for the post-war period, still considering the problems of Government expenditures and the raising of funds to meet them. The question of inflation is necessarily in the picture and must be considered. Then we must give some thought to the impact of our present tax laws on the business enterprises, especially some of the provisions which will particularly affect the mining industry.

Our Federal Government plans to spend in this fiscal year, which ends June 30, 1943, some $84 billion; to receive from taxes and other Government revenue $21 billion; leaving $63 billion to be borrowed. Of the borrowings some $3 billion is to come from Government trust funds, particularly Social Security moneys, and the balance of $60 billion will be borrowed from the public, the banks, insurance companies and other investors. The $21 billion of revenues for this fiscal year will be in part the revenue to come under the new 1942 Act and in part the revenue under the prior law.

Our income tax is now our principal source of revenue. For our purposes we can better look at what the new revenue act would be expected to yield in a full year of operation because that gives a better picture of where we are heading than comes from the consideration of the amounts collected in the current fiscal year.

Any estimates made are full of doubt today. Estimates of yield depend not only on total national income, but no less on the distribution of that income and the consequent rates of tax to which it will be subjected. The yield from excess profits tax and also from corporate income tax may be largely affected by renegotiation of war contracts.

While in the long run there may not be much net difference whether a few billion dollars of possible corporate profits are eliminated through renegotiation or whether they are subjected to a 90 percent excess profits tax, this may make a substantial difference in the amount of tax revenue.

For our purpose, then, let us consider that for a full year of operation at present income levels we may expect our Government revenues to be roughly as follows.

The Treasury, in figures submitted to the Senate Committee on Finance July 23, 1942, estimated taxable returns from 1,266,000 persons having more than $5,000 a year would show aggregate net incomes of $14½ billion. Of this $6.3 billion would be income below the $5,000 a year amount and $8.2 billion would be income above $5,000 a year. It further estimated 25,634,000 taxable returns from persons having incomes less than $5,000 a year, showing aggregate net incomes of $45.9 billion. This would make a total of $60.4 billion of net income on taxable returns of which the Treasury estimated only $31.5 billion would be taxable, leaving $28.9 billion to represent exemptions.

If we assume that the total of indi-

The President's Budget Message of January 6, 1943, presents somewhat different estimates from those used in this article which had been previously prepared.

The Budget estimates, in brief, are—

	Fiscal Year 1943	Fiscal Year 1944
	Millions	
Receipts:		
Income and excess profits taxes—corporations	$9,770	$14,555
Income and victory taxes—individuals	7,798	13,087
Reimbursements on renegotiation	350	250
Employment taxes	1,472	1,982
Other receipts	5,162	5,532
Total Receipts	$24,552	$35,406
Deduct:		
Net appropriation for Federal old-age and survivors' insurance trust fund	$1,076	$1,525
Post-war credit for excess-profits tax and victory tax	500	800
Net Receipts	$22,976	$33,081
Expenditures	80,437	104,129
Excess of Expenditures	$57,461	$71,048
Public debt—by June 30, 1944		$210 billion

The budget estimates are based on existing revenue laws, but the President recommends collecting not less than $16 billion additional "by taxation, savings, or both, during the fiscal year 1944."

While these estimates, by fiscal years, are manifestly different from those used in this article, they do not essentially change the tax picture here presented, but they do further emphasize certain points.

vidual net incomes would be about $100 billion, this would leave about $40 billion of nontaxable individual incomes not reported on taxable returns. Adding this to the $28.9 billion of exempt income on taxable returns, makes $69 billion exempt from income tax, compared with $31 billion subject to such tax.

The Victory tax is estimated to yield $3.1 billion, of which $1.1 billion would be refundable, a net revenue yield of $2 billion. This tax would apply to some $62 billion—twice the amount subject to other income tax as shown in Table I.

Table II does not take into account approximately $2 billion of Social Security taxes which go into the Social Security trust or reserve funds, nor approximately $2 billion of post-war credits under the Victory Tax and the excess profits tax which are to be refunded after the war. While the cash from these sources will be available and spent, this must be considered as borrowed money rather than revenue.

Based on expenditures of approximately $85 billion, deducting revenues of $25 billion, would leave $60 billion to be borrowed. This would mean borrowing $5 billion a month.

I am not questioning that the Government can and will borrow what is necessary for the war, even if it has to resort to forced borrowing or to use Federal Reserve to absorb excess borrowing through banks. I think we all agree, however, that it would be very desirable to raise more through tax revenues if possible.

Our Possible Sources of Revenue

Considering first corporate income estimated at $17 billion from which we expect to take $9 billion in taxes, leaving only $8 billion for return to stockholders and for corporate working capital and reserves, I think most of us feel that our corporate income and excess profits taxes under this bill are already passing the point of productivity. Under the impact of war and the patriotic spirit we undoubtedly can maintain corporate activities even though there is not the profit margin which in normal times would be necessary to warrant the risks involved in business activities.

Yet there are definite limits to which we can press this thought. Corporate managements stand as trustees for the stockholders and they cannot wholly disregard the risks in using the properties and funds in their hands. So it is doubtful if we can obtain more revenues from corporate incomes except as incomes themselves increase. A further increase in tax rates might so pass the point of productivity as to yield less revenue. In any event, there is no additional revenue to be obtained from taxation of corporate incomes

TABLE I

INDIVIDUAL INCOMES

Net income in excess of $5,000 a year	$ 8,000,000,000
Net income less than $5,000 a year subject to Income and Victory tax	23,000,000,000
Net income less than $5,000 a year subject to Victory tax only	31,000,000,000
Exempt personal income	38,000,000,000
Total individual incomes	$100,000,000,000

The Treasury also estimated aggregate taxable net income of corporations approximately $17 billion.

TABLE II

ESTIMATED EXPECTED YIELD UNDER OUR PRESENT TAX LAW FOR A FULL FISCAL YEAR AT THE PRESENT SCALE OF NATIONAL INCOME

Individual income taxes:	
On $ 8,000,000,000 over $5,000 a year	$ 4,000,000,000
On 23,000,000,000 under $5,000 a year	5,000,000,000
31,000,000,000 subject to income and Victory tax	9,000,000,000
On 31,000,000,000 subject to Victory tax only	1,000,000,000
Total individual income and Victory taxes	10,000,000,000
Corporation income and excess profits taxes:	
On $17,000,000,000	9,000,000,000
Miscellaneous revenues from all other sources	6,000,000,000
Total	$25,000,000,000

which would be material as compared with a $60 billion deficit.

Next as to the $8 billion of individual income which is in excess of $5,000 a year. Let us look for a moment at the tax rates to which this will be subject (for a married person with no dependents, taking the aggregate normal and surtaxes and victory tax):

	Percent
At $5,000 a year	26
At 10,000 a year	38
At 20,000 a year	66
At 50,000 a year	77
At 100,000 a year	88

Certainly the higher brackets have already passed the point of productivity. Perhaps there is something more which might be obtained from increased rates on income of from $5,000 to $10,000 a year or possibly up to $20,000 a year, but at best there is no material amount of additional revenue which could be taken out of the estimated $8 billion for income above $5,000 after allowing for $4 billion to be taken under present rates.

Then we can consider the $23 billion of income below $5,000 which is subject to income tax. We are now starting with a 19 percent normal and surtax plus a 5 percent victory tax, a total of 24 percent, to raise $5 billion out of this $23 billion. Out of the remaining $18 billion there is perhaps some margin of additional revenues which could be obtained without passing the point of productivity.

Then we look at the $60 billion of income not subject to income tax because it is covered by exemptions. About $30 billion of this which will be subject to the 5 percent victory tax, leaves: only perhaps $30 billion which is entirely exempt from taxes. If we are to raise any substantial additional revenues it is manifest that they must come from the $60 billion not subject to income tax except to the extent that we may be able to raise some additional funds from income now subject to income tax. In all of this I am considering the ultimate source of the revenue, assuming we do not intend to impose concealed taxes which will simply have an inflationary effect.

For example, if a sales tax is imposed which is to be paid by the consumer, it is just as surely a charge against that consumer's income as would be an income tax on his income. If we impose a sales tax to be paid by the seller and simply reflected in an increased selling price of goods to the purchaser, that will fall just as effectively against a consumer's income as would an income tax. If, however, we impose a sales tax to be paid by the seller without increase in the selling price of the goods, then that must come out of the seller's income.

So I think we can recognize clearly that if we are to obtain any substantial amount of additional revenue without its having inflationary effects it must come from the net income of individuals below the $5,000 a year line and we must further recognize that most of it must come from incomes below the $3,000 a year amount.

Increased tax collections which simply represent partial recoupment of increased Government expenditures are not here considered as representing any real increases in Government revenues.

This then presents the very definite question of whether we should try to raise any substantial amount of additional revenue to reduce our present borrowings—knowing that the bulk of that revenue must come from the lower incomes if we are not to have inflationary taxation—or whether we

should determine on some further taxation knowing that it must fall principally on these lower incomes.

When we have decided this question it will then be much easier to determine the kind and rate of taxes we wish to impose. I have been discussing revenues, but we must also consider expenditures, and we must spend immense amounts to win this war. We must spend whatever is necessary to that end. But if we realize that every dollar unnecessarily spent must be paid by those with low incomes (for we cannot raise enough by taxes on corporations and on the higher incomes to pay the absolutely necessary expenses) I think there will be far more insistence on avoiding all possible waste and extravagance and effecting every possible economy.

As to the Future Outlook

With over $80 billion estimated expenditures for 1942, we are already planning for over $100 billion of expenditures this year. Without knowing how many years the war may last, we quite contemplate that by the end of the war we may have piled up a debt of $250 billion or more. This is a tremendous debt. If we estimate 35 million families, this would be a debt which would average over $7,000 a family. We only need to look at the figures to see that there is no hope of having that debt paid off out of future income of the corporations or of the individuals with high incomes. It must fall against the bulk of the people and can be met in no other way. They and they alone have sufficient amounts of aggregate income to meet it.

The amount of that aggregate debt is not in itself a feature which should disturb us if we could look ahead and see the probability that after the war we could expect an excess of Government revenues over expenses which could carry the interest on that debt and gradually amortize it.

Our present tax law at the current level of national income, which we may estimate at about $120 billion, will yield around $25 billion of revenue. If after the war we could expect our national income still to maintain that average and that the distribution of incomes would be as it is today, we might expect to continue to raise $25 billion a year. Then we must look at our probable Government expenditures.

Let us assume that our present non-defense expenditures, exclusive of interest, are running about $5 billion a year, whereas before the war they had been running from $8 billion to $10 billion. Will we be able to keep these below $10 billion a year in the post-war period? Assume we could keep them at the $5 billion figure. Then we might be contemplating something as shown in Table III.

TABLE III

Non-defense expenditures	$ 5,000,000,000
Interest on indebtedness	5,000,000,000
Army and Navy on the expanded scale which may then exist, perhaps	6,000,000,000
A total of	$16,000,000,000
Then we will also have our post-war refunds to make which may run to a further	2,000,000,000
Total	$18,000,000,000

This $18 billion is before providing for any debt retirement. If we expect Government revenues of $25 billion a year, that would leave about $7 billion a year for debt retirement, which would not be a disturbing situation. If, however, our non-defense expenditures should be doubled in the post-war period, there would be little left for debt retirement. Of course, this is on the assumption that we could maintain from existing tax laws a $25 billion a year yield which does not seem probable.

We should have to expect that an excess profits tax would then have little productivity. It is doubtful if we could maintain a 40 percent corporate normal and surtax without having it dry up revenues at the source, and there is the further possibility of lower yield from the higher individual incomes. Looked at in this way we do not have a very bright picture of post-war years.

If, however, we could, as has been suggested, raise an additional $6 billion over the war years, making a present yield of some $31 billion, then we would be nearer to having a base which could allow for some post-war shrinkage.

Inflation

There has been much talk of imposing taxes to control inflation. I am not very confident of taxation as a very reliable means of inflation control. Manifestly, there is less tendency to inflation if Government expenditures are met from taxes than if they are met from borrowing.

However, let us look again at our present picture. We can say we have adequately squeezed out the inflationary possibilities as to corporate incomes. Certainly after providing the necessary corporate reserves we are not expecting dividends in amounts which would be inflationary.

We can further recognize that we have more than squeezed out any inflation from the higher incomes. So the inflation problem as related to taxation seems to stand about as follows:

From $100 billion of individual incomes we expect to take about $10 billion of taxes but from about $92 billion of incomes of less than $5,000 we expect to take only about $6 billion in taxes. This in itself will not be a very effective deterrent to a possible $30 billion or $40 billion inflationary surplus.

Of course, we know that there are many whose incomes will not increase, some whose incomes will decrease. It is not from them that there is the inflationary danger. It is to come from others, as for example:

The married man who had previously been receiving $1,200 a year but now is getting $2,200. Out of the $1,000 of additional income the income tax and victory tax will take $215, so his increase in net income after taxes will be $785. It is this increase of $785 which has its inflationary aspects. Of course, we could take other figures and other increases with somewhat different results, but this seems a fairly typical illustration. It is from such conditions that our inflationary surplus arises coupled with a decrease in available goods.

Of course, there is talk that people such as that need their increased incomes in order to raise their general standard of living. The difficulty is that when we are producing less in goods than we were formerly, we cannot out of a decreased quantity of goods provide for an increase in consumption. We know that there are very many things for which people would previously have spent money which are not available today—automobiles, refrigerators, radios and a wide range of other articles. So that the elimination of all these now unobtainable articles further increases the inflation pressure, on other articles that still can be procured. There is no question we want to place a curb on inflation. We are doing this through price-fixing, through allotments and otherwise, but all of this is not going to expand the quantity of goods available so that our people as a whole can have more of the goods than they previously had.

I am not trying here to discuss the entire inflation problem, but merely to point out how very little we have done in our tax laws to curb inflation where it exists; and to note that there are no taxes which can be imposed which will halt inflation unless the taxes are made to fall against the incomes which carry the inflationary threat.

The Practical Impact of Taxation

We have been looking at the overall picture. What of the practical impact of consequent taxes on business and investment? Much will depend on technical provisions of the tax laws,

as well as on tax rates. The amount we may want to raise by taxation will undoubtedly be influenced by the scale of Government expenditures, but the volume of revenues obtainable from business and investment incomes, from salaries and wages, and the entire fabric of our national income will depend on whether or not we have a broad, prosperous, industrial activity, continually replenished with new investment. If, by high tax rates or unwise tax provisions, we make business investments unattractive, we shall expect to suffer a shrinkage in the incomes from which taxes may be derived, at the same time we shall suffer from lack of production and lack of employment.

The intricacies of our tax laws are such that their practical effects will vary with differences in conditions or technicalities, but a few simple examples may illustrate general trends and results of Federal income and excess profits taxes.

(a) In 1939, if a corporation earned $1,000,000 and paid a corporation income tax of 17 percent (the 1939 rate applicable where its remaining net income after tax was distributed), its tax would be $170,000 and it would have left net $830,000.

If this entire $830,000 were distributed to individual stockholders who were taxable thereon at 21 percent (the 1939 rate next applicable on income in excess of $25,000), the stockholders would pay $174,300 Federal income taxes and have left net $655,700.

Thus, out of $1,000,000 earned by the corporation in 1939, Federal income taxes would have taken $344,300 and there would be left to the stockholders $655,700.

Because of these taxes, the corporation in 1939 had to earn 1½ times the net return to such stockholders.

(b) In 1942, if a corporation earned $1,000,000 and paid only the normal and surtax rate of 40 percent (not being subject to excess profits tax), its tax would be $400,000 and it would have left net $600,000.

If this entire $600,000 were distributed to individual stockholders taxable thereon at 63 percent (the 1942 rate next applicable on income in excess of $25,000 plus victory tax), the stockholders would pay $378,000 taxes and have left net $222,000.

Thus, out of $1,000,000 earned by the corporation in 1942, Federal income taxes would have taken $778,000 and there would be left to the stockholders $222,000.

Because of these taxes, the corporation in 1942 (not subject to excess profits taxes) had to earn 4½ times the net return to such stockholders.

(c) If, in 1942, the corporation earned $1,000,000 but half the amount were subject to the 90 percent excess profits tax, then the corporation's normal, surtax and excess profits taxes would amount to $650,000 and it would have left net $350,000.

If the entire $350,000 were distributable to stockholders taxable at 63 percent thereon, the stockholders would pay $220,500 and have left $129,500.

In such case, out of $1,000,000 earned by the corporation, these taxes would have taken $870,500 and left to the stockholders $129,500.

The corporation in 1942 (where one-half its earnings were subject to excess profits tax) had to earn 7¾ times the net return to such stockholders.

Other illustrations could be given to show the results under different circumstances and conditions, but the foregoing show comparative results, tabulated in Table IV.

TABLE IV

	Corporate Earnings	Corporation Tax	Individual Tax	Net to Investors
(a) For 1939	$1,000,000	$170,000	$174,300	$655,700
For 1942:				
(b) Income tax only	1,000,000	400,000	378,000	222,000
(c) Income Tax, plus Excess Profits Tax on one-half corporate earnings	1,000,000	650,000	220,500	129,500

If in each case this were on a total investment of $6,250,000 (but in case (b) the corporation had a base period earnings credit of $1,000,000, whereas in case (c) it did not), the net return to investors as a percent of capital, and the ratio of corporate earnings to net return to investors would be as follows:

	1939 (a) Percent	1942 (b) Percent	1942 (c) Percent
Percentage on capital:			
Earned by corporation	16	16	16
Yielded to investors	10.5	3.6	2.1
Number of times net yield to investors must be earned by corporation	1½ times	4½ times	7¾ times

These examples in Table IV are over-simplified and of limited scope (which you can supplement as you wish) but they definitely raise certain questions:

(1) *What is the percent of return on capital necessary to warrant an investment?* The risk involved must be estimated for each investment. If the risk is such that investment is not attractive unless there is expectation of at least 10 percent annual return, case (a) would be attractive, but cases (b) and (c) would be unattractive. Case (b) would be attractive only if the investment were so safe that a return of less than 4 percent could be considered adequate to cover the risk. If we had to look at such results as these representing average future expectancy, we could say that cases (b) and (c) would rarely, if ever, be attractive.

(2) *Can we expect corporate earnings to be so many times the net return to the investor?* Unless we expect business to be able to earn 4 to 8 times a reasonable return to the investor, 1942 tax rates make investment unattractive to stockholders taxable at high rates. But can our industrial system survive such a strain of trying to earn so much more than a reasonable return to the investors—to say nothing of its inflationary aspects? Yet, unless we can hope to achieve this, we cannot hope for investments to be made in such cases as (b) and (c).

The figures become fantastic if we look to see what corporate earnings in case (b) would yield a net return of 6 percent to the investor—assuming a prospective investor would consider 6 percent a minimum return to warrant its risk. On an investment of $6,250,000, 6 percent would be $375,000. In case (b) the corporate earnings would have to be $5,067,565 to leave to the investors $375,000 after paying the 80 percent tax (the maximum rate applicable in this case if earnings in excess of $1,000,000 were subject to excess profits tax) and paying 63 percent tax on the balance distributable to the stockholders. Here the corporate earnings would have to be almost 14 times the net to the investors.

If our answer is that we do not want persons with incomes over $25,000 to be making investments in business, then we must be prepared to stand the consequences. The Government must face the loss of taxes it would derive from the higher incomes and either drastically curtail its expenditures, or impose an increased tax load on lower incomes.

Even so, the question arises, if by high taxes we make investments unattractive to those with large incomes, can we get a sufficient volume of financing from those with low incomes to maintain our industrial system?

Even for those with lower incomes the picture is not so very attractive. If the individual were subject to only a 30 percent tax (the approximate rate of income and victory tax, less

(*Continued on page* 111)

NOTE: The post-war credit of $45,000 is not here taken into account, since it will not be presently distributable and when received by the corporation is apt to be absorbed by post-war losses, so the stockholders may never receive it.

Ventilation Survey Methods

A Report, as presented to the Ventilation Committee and approved at their meeting on December 1, 1942, discussing possible sources of error in making air volume measurements by anemometer, and outlining ways in which such errors can be avoided.

By RAMOND MANCHA

THE TIME is propitious for the exercise of greater care in the measurement of underground air volumes at various stations along the air circuit. These readings are customarily obtained by means of an uncalibrated anemometer held in the hand of the observer for one minute at the center of the air course. Sometimes in an attempt at improved precision the instrument operator will attempt to traverse the entire section during the minute interval by moving the anemometer back and forth and up and down over the plane of the measuring station. On the other hand, however, the observer will actually seek out the point at which the anemometer rotates fastest and will use this point as a measure of the average velocity passing the station.

Air Volume Measurements

The likelihood of obtaining air volume measurements in the abovementioned manners, which are even approximately accurate, is extremely remote. It would appear highly desirable to adopt a standard method of air measurement which insures a high degree of accuracy and which requires no more time, provided that such a method is available. It so happens that this is the case and I will therefore explain a simple procedure which can be easily followed by any mining company employe who is at all familiar with air volume measurements.

Having selected the station for air volume measurement and having accurately established the true section area of the station, the instrument operator should stand in the center of the air course at a distance slightly less than arms length downstream from the measuring plane. A calibrated anemometer should be attached to the end of a stick or rod of sufficient length to permit the observer to reach both ribs without moving his body location, or by standing in one place. This stick or rod can be made up in short sections so that the sections can be easily carried underground. During the traverse the instrument should be held in each of 12 positions for a period of five seconds per position. These 12 instrument positions should correspond to the centers of 12 rectangles obtained by stretching two strings horizontally across the air course spaced between top and bottom at the ¼ and ¾ points, and three strings stretched vertically from top to bottom spaced at the ¼, ½, and ¾ points between ribs. Actually it is not necessary to install the strings, since with a little practice one can judge the approximate location for each anemometer position with sufficient accuracy by eye.

At the start of the traverse the instrument operator should stand in a position from which he can reach the anemometer with his hand and thereby start the instrument. Immediately following the start of the instrument the observer should take his position in the center of the air course downstream from the measuring plane and permit the instrument to operate in the center of each rectangle for five seconds, being timed by a stop watch held in the hand. The instrument should be permitted to run continuously throughout the traverse without interruption and as the time of operation in the last rectangle approaches five seconds the instrument operator should walk over sufficiently close to the instrument to reach over and turn it off at the prescribed time. In this manner the influence of the observer's body upon the air flow past the measuring station remains unchanged through practically the entire time of measurement so that a fairly accurate average velocity is thus obtained. It is important that the instrument correction be applied as indicated by the calibration chart.

By following this recommended procedure the customary inaccuracies are either eliminated or reduced to a minimum, such as the following:

1. Errors resulting from one position reading.
2. Errors resulting from improperly timed traverse rate.
3. Errors resulting from holding the instrument close to the body throughout the traverse in higher than average air velocities.
4. Errors resulting from changing the flow pattern past the measuring plane during the time of traverse by continuously changing the observer's body location.
5. Errors resulting from neglecting the anemometer calibration.

When measuring air at a section obstructed by one or more roof props located away from the rib, the question is often raised as to the advisability of deducting for the projected area of the obstructions. A simple rule to follow is that no deduction should be made unless the width of the obstruction is equal to or greater than the horizontal distance between anemometer positions.

Underground Pressure Surveys

It is frequently desirable to indicate on the mine map the actual absolute pressure existing at various points along both intake and return, especially along the free split. The altimeter is the instrument which finds most popular usage in this connection and its application has been frequently discussed and described by

different observers. Most observers agree that accurate altimeter surveys should be conducted upon idle days by means of two altimeters. One instrument is for the purpose of recording barometric fluctuations during the traverse and should be located at the surface. The second instrument is used for determining the pressure gradient throughout the circuit and should be applied with proper corrections for elevation, temperature and time.

Advantages Gained by Use of Three Anemometers

In my opinion, however, a third altimeter should be employed in order to insure accurate results. There is always the possibility of an unheralded roof fall on the air course at a point upstream from and close to the point of pressure measurement with a single altimeter, which would have the effect of lowering the absolute pressure at all points on the air circuit downstream from the fall. The presence of the fall might not be immediately detected by volume reduction since the volume constantly changes along the circuit as a result of stopping leakages of variable amounts. Therefore, the indicated pressure difference between two points within the circuit might be incorrectly measured as a result of a fall on the air course which occurs between the time of pressure measurement at each point. The third altimeter would be used for pressure measurement at the second point simultaneously with pressure measurement at the first point, thus directly measuring the instantaneous pressure difference between the two points. The use of a third altimeter is of particular advantage when it is desired to determine the pressure differential between two isolated points on the circuit rather than to conduct a closed traverse.

When measuring the pressure difference between two points on an air course located within a few hundred feet of each other, this measurement can be performed with a greater accuracy by use of an inclined manometer equipped with 100 ft. of rubber tubing attached to each side of the instrument. Thus the instantaneous pressure differential between points 200 ft. apart can be directly read without the necessity of correcting for temperature, elevation or time. A continuous traverse throughout the circuit with the inclined manometer would necessitate traveling a more considerable portion of the air course than is required using altimeters, due to the necessity of restricting the hose lengths to 100-ft. sections as a matter of convenience.

The altimeter operators, on the other hand, can travel the haulage road between points of pressure measurement and ordinarily should take pressure readings at more widely spaced locations.

Underground Velocity Survey Made with Velometer

At any particular mine there is an approximate value for the maximum allowable underground air velocities. This value depends upon various local conditions such as power value, roof conditions, air volume requirements, etc. Therefore, at any particular mine the air courses can be easily policed with a velometer, which is an instrument that indicates air velocity instantaneously. By means of the velometer, regions of unusually high air velocity can be quickly determined and by means of the inclined manometer equipped with rubber tubing the seriousness of the excessively high velocities can be evaluated before correcting the condition by cleaning the air course.

An underground velocity survey with the velometer is therefore a quick and fairly reliable means of ferreting out trouble, which should be generally employed.

Determining the volume of air by use of the anemometer

Going for the Lifters

WITH THE

CLEVELAND D24 DRIFTER

THE Cleveland D24, shown here, is working in the Cripple Creek district of Colorado. A streamlined, one man drifter, it does an outstanding job in any kind of ground. Its important features include the short-stroke, featherweight valve that insures maximum delivery of work with minimum use of compressed air. Also a strong, one-piece guide shell—no standard rods to work loose. It's easy to crank and has little feed screw wear.

The D24 is available with hand crank or automatic power feed. With 24" steel change, crank feed type weighs 125 lbs., power feed, 171 lbs.; 30" steel change available with either type. The power feed type can also be purchased with a substantial sliding cone guide shell.

Bulletin 130 contains complete information and engineering specifications. Ask for it.

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LEADERS IN DRILLING EQUIPMENT

War Metals On Their Way

ER—Deep under the "richest hill on earth" at Butte, this miner's drill starts copper ay to the fighting fronts. From valuable ore such as this, eventually come hundreds sands of tons of Anaconda Copper Alloys (Brass and Bronze) and endless miles rical wires and cables to equip the complicated weapons of war . . . 3,000 pounds lying Fortress, 1,000 tons for a battleship.

—When this zinc leaves Anaconda refineries . . . now setting all-time production . . . it will be alloyed with copper to make brass for ammunition metal. In this war, ammunition is by far the most important single use of zinc . .. for instance, hting planes shoot over 9 tons of brass in every minute of continuous combat.

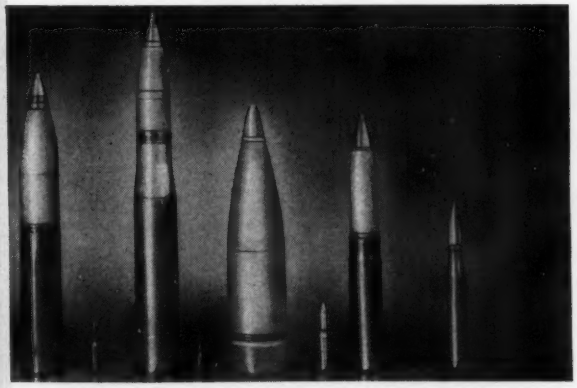
MANGANESE—This 270 ft. rotary kiln at Anaconda, Montana, largest oven of its kind, is helping to make America independent of foreign sources of manganese, so indispensable to steel making. Thanks to Anaconda engineers who developed a special process for treating low grade Montana ores, Anaconda is now this country's largest producer of manganese.

EVERY HOUR of the day Anaconda Copper Mining Company and its Associated Companies are stepping up production of copper, zinc, manganese and other war-strategic metals. Not of copper tube or brass piping for plumbing . . . not of copper sheet for gutters and flashings . . . not of bronze for hardware and screens, but metals in an ever mounting tide to meet our country's war needs.

That so many of their former fellow employees are serving in the armed forces—7,029 as of Nov. 30th—is a constant spur to all Anaconda men and women. The Army-Navy "E" pennant for excellence in production flies over ten plants. Every department in the United States is participating in the payroll deduction plan for the voluntary purchase of war bonds.

All told, 64,363 members of the Anaconda organization are working at mine and furnace, press and bench, laboratory and desk . . . as the tide of metals flows faster and faster for victory.

42300B



—From such plants as those of The American Brass Company, largest copper ss fabricator, stream millions of pounds of copper and copper alloys **every day.** per content of the brass required for ammunition alone is two-thirds of what the ation consumed for all purposes in 1929. Tremendous quantities are likewise eeded for ships, tanks, and planes.

OTHER METALS—Anaconda is producing great quantities of war precious metals such as arsenic, bismuth, cadmium, lead, molybdenum, palladium, platinum, selenium, silver and vanadium. In addition, Anaconda is managing for Government account huge new chromium and magnesium operations . . . all to make the United Nations stronger . . . to bring them closer to Victory.

ANACONDA COPPER MINING COMPANY

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GREENE CANANEA COPPER COMPANY

THE AMERICAN BRASS COMPANY
ANACONDA WIRE & CABLE COMPANY
INTERNATIONAL SMELTING & REFINING COMPANY

Wheels of Government

As Viewed by A. W. Dickinson of the American Mining Congress

IMPORTANT COMMITTEE appointments in the organization of the new Congress carry a very real interest for mineral producers. On the Senate Finance Committee the one new appointee is Senator Scott Lucas from the down-state region of the important coal producing State of Illinois. On the Republican side of the committee Senator Arthur Capper of Kansas has left, but the three new additions—Senators John Thomas of Idaho, Hugh A. Butler of Nebraska, and Eugene D. Millikin of Colorado—are from the West, and Thomas and Millikin are well acquainted with the problems of mining in their respective States.

The new Democratic members of the House Committee on Ways and Means are regarded as broad-gauge, able men. They include Noble J. Gregory of Kentucky, A. Sidney Camp of Georgia, Walter A. Lynch of New York, Thad F. Wasielewski of Wisconsin, Paul H. Maloney of Louisiana, and Aime J. Forand of Rhode Island. The new Republicans are Richard M. Simpson of Pennsylvania and Charles S. Dewey of Illinois, who served as an assistant secretary of the Treasury under President Coolidge. Another interesting House appointment is that of Republican Clarence J. Brown of Ohio who is the sole new member of the Committee on Rules, replacing Representative William L. Nelson, Democrat, of Missouri.

After increasing the national debt limit to $210 billion the Ways and Means Committee will have before it a heavy program of controversial matters, including one or more revenue bills, extension of the Lend-Lease Program, renewal of the authority to negotiate Foreign Trade Agreements (expiring June 30), revision of war contract renegotiation requirements, extension of the Guffey Coal Act (expiring April 26), expansion of Social Security legislation, and perhaps a Third War Powers Act giving authority to suspend tariff and immigration statutes for the duration.

★★★★★★★★★★★★★★★★★★

Washington Highlights

NEW CONGRESS: Committees have able men from mining states.

NATIONAL DEBT: Up we go!

INCOME TAX: Ceiling unlimited?

SOCIAL SECURITY TAXES: 10 percent of payroll—maybe.

PREMIUM PRICES: Levels for zinc and lead boosted.

MINE LOANS: RFC eases requirements.

WANTED QUICK: Miners for northwestern coal mines.

EASTERN COAL: Joyrides to wide open spaces.

MANPOWER "FREEZING" PLAN: Begins to jell in metal mines.

WAR LABOR BOARD: Spreads its wings.

WPB PREDICTION: CMPlan will improve mining's position in respect to deliveries of equipment.

★★★★★★★★★★★★★★★★★★

Expenditures and Taxes

The Chief Executive's budget message to the Congress has called for a cool $109 billion for expenditures, and taxes sufficient to bring in $16 billion of addition revenue. It is now anticipated that the national debt will reach $210 billion by June 30, 1944.

The revenue-raising plans of the Congress have not yet been formulated but there are informal discussions of doing away with the 5 percent "Victory Tax," eliminating part of the 1942 income taxes, and imposing a flat 25 percent withholding tax. Such a plan would probably put incomes below $3,000 on a current payment basis, and would call off individual 1942 income tax liabilities in the first taxable bracket and up to 19 percent of the 1942 income tax in the higher brackets. Emphasis rests on tapping the lower range of incomes and in addition to this a sales tax will probably be necessary.

It is anticipated that further revenues will be sought by the Administration from social security taxes. It is believed that the rates proposed will aggregate 10 percent of payrolls, divided equally between employers and employes. Four percent would be for old-age and survivors' insurance, with permanent disability insurance added; 4 percent for a federalized unemployment compensation system; 1 percent for temporary disability (health) insurance; and 1 percent for hospitalization. The Social Security Board is reported as believing that 10 percent will not carry the load indefinitely as old-age insurance cost increases each year, but that such a rate will suffice for about 10 years. The present old-age tax rates of 1 percent each on employers and employes will, under the existing law, rise to 3 percent on each by the year 1949.

Premium Prices for Zinc and Lead Boosted

At the Western Division AMC War Conference in Salt Lake City in November, pointed discussion developed on the need for a further expansion of the Premium Price Program to meet increasing costs and stimulate production of lead and zinc. The round-table sessions on both lead and zinc, which were held at night, emphasized the absolute necessity for action on the part of the War Production Board, the Office of Price Administration and the Metals Reserve Company.

It is now known that three premium levels have been established for zinc and two for lead. As previously the

first zinc premium, designated as "A," consists of 2¾ cents per pound; the new "B" premium is 5½ cents per pound and the new "C" premium is 8¾ cents per pound. With the original ceiling price of 8¼ cents per pound on zinc the production in excess of an "A" quota now calls for 11 cents per pound; in excess of a "B" quota 13¾ cents per pound; and in excess of a "C" quota 16½ cents per pound.

The "A" premium on lead remains at 2¾ cents per pound and the new "B" premium is 5½ cents per pound which, with the ceiling price of 6¼ cents, makes a total price of 11¾ cents for production in excess of "B" quotas.

Coupled with the announced extension of the premium price system to July 31, 1945, the WPB-OPA Quota Committee and the Metals Reserve Company are now in position to encourage additional production of both zinc and lead from ore bodies of limited extent or of lean contents.

No change is indicated in the 5-cent premium on copper which with the 12-cent ceiling makes a total of 17 cents per pound.

RFC mine loan circular No. 14 has been revised and reissued and now provides that loans for mine development, and loans for the construction, improvement or repair of productive facilities, purchase of equipment, working capital, etc., are limited to "an amount reasonably required to accomplish the purpose." Removed is the requirement that the applicant shall have been engaged in the mining operation, but it is provided that he "must be the owner or lessee of the property or of the right to remove the ore." Applying only for the duration of the war and stemming from Section 5d (2) of the RFC Act the circular does not require a showing that development will result in ore of sufficient quantity and value to pay a profit. Amounts may be borrowed up to $30,000 covered by a note payable out of the profits of mining, with larger amounts requiring the execution of a mortgage on the property.

Equipment and Supplies

The situation of the mining industry under the Controlled Materials Plan is clarifying to a gratifying extent. It is recognized that the "controlled materials"—steel, copper, and aluminum—are used by the mines, preparation plants, mills, smelters and refineries for productive facilities and not as raw materials for fabrication. Thus it is expected that these industries will be permitted to carry on with orders P-56, P-58, and P-73 for new equipment, maintenance and repair materials and operating supplies. It is stated that the Mining Equipment Division in WPB will receive an allotment intended to cover the mining and smelting industries' direct needs for the maintenance of production and for increased production, as well as the material needs of manufacturers for new mining equipment and repair parts. WPB officials predict that the CMP plan will improve the position of the mining industry in respect to deliveries of equipment.

Director Arthur Knoizen of the Mining Equipment Division has recently organized and conducted meetings of an informal committee on the coal industry and an informal committee on the metal and non-metallic industries. These committees are made up of representative and able men selected geographically and the meetings have resulted in a feeling of greater confidence and satisfaction in the equipment and supplies situation on the part of the industry. Also created in an Industry Advisory Committee, a formal WPB organization, of manufacturers of mining machinery and equipment. By this means a closely knit relation is being established between the War Production Board and the mining industry which is certain to result in an improvement in the procurement of equipment and supplies, and in production of needed minerals.

Urgent Manpower Need for Western Coal Mines

T. J. Thomas, who is in charge of bituminous coal in the Office of the Solid Fuels Coordinator for War, has just made an urgent plea to WPB and the War Manpower Commission to furnish experienced coal miners in the northwest region where production is now so badly needed. Placement of additional men is asked as follows:

750 Experienced miners in Washington,
350 Experienced miners in Utah,
450 Experienced miners in Wyoming,
250 Experienced miners in Colorado,
200 Experienced miners in New Mexico.

Mr. Thomas stated that the situation has become so critical that a quarter of a million tons is being moved from Duluth and Superior to the State of Washington. He further said "it is stupid and silly to move eastern coal virtually all the way across the country to meet the demand for fuel in the northwest Pacific States which the mines there and in the Rocky Mountain region could supply if they had sufficient experienced miners."

A review and discussion of the "Certificate of Separation Plan" and its operation in the 12 western states was conducted in Denver by War Manpower Commission officials on January 18 and 19. The so-called "freezing" plan was discussed by nonferrous and strategic metal producers from Montana to Arizona and in general the expressions indicated that the plan under the order of September 7, 1942, has resulted in a decrease in labor turnover. Five subcommittees of management-labor men appointed at the meeting by WMC Deputy Chairman Fowler V. Harper reported on the following subjects: (1) extension of labor stabilization program, (2) relationship with Selective Service System and full labor utilization, (3) improvement of morale, (4) improving compliance with the employment stabilization order at points of separation, (5) cooperation with other Government agencies related to the manpower program. The subcommittee reports were not unanimous. After conducting a similar meeting for the logging industry at Seattle Fowler Harper and his staff are expected to analyze the information developed and to bring forth area or regional plans which will cover the war production districts of the country.

The War Labor Board has centralized its activities by creating 12 regional labor boards with authority to make final decisions on industrial disputes and on voluntary wage and salary adjustments. The regional boards will be supplemented by sub-boards or panels functioning in the larger cities and industrial areas. It is planned to handle labor disputes in the following manner: (1) mediation efforts by the Conciliation Service of the Department of Labor, (2) hearings before regional board's panels resulting in recommendations to the regional board, (3) final ruling by the regional board. In the case of the non-ferrous metals industry, however, new cases will be handled by the Non-Ferrous Metals Commission already established with headquarters in Denver.

Guffey Act Extension

A bill (H. R. 1454), originating in the Bituminous Coal Division, Department of Interior, has been introduced by Chairman Robert Doughton of the House Committee on Ways and Means. Largely confined to amendments affecting administrative procedure, the bill would also prolong the life of the Bituminous Coal Act of 1937 until the "first day of July following the expiration of a period of two years from the date upon which the President, by proclamation, or the Congress by concurrent resolution, declares that hostilities in the present war have terminated."

Cracking Hard Rock on "The Hill"

Mining Congress Journal will furnish readers, upon request, with official Government statements on any of these brief summarized announcements

COAL

No. 9 Coal Prices Established. Office of Price Administration. Maximum prices for Production Group No. 9 coals (mine run) in District No. 15 (Texas, Kansas, Missouri and eastern Oklahoma) are established at levels identical with those of Group 8 in the same district, the OPA announced December 26 through Amendment 31 to MPR 120.

Locomotive Coal Prices Equalized. Office of Price Administration. Maximum prices of bituminous coal used as locomotive fuel were equalized in Districts Nos. 3 and 8 between off-line and on-line railroads in Amendment 32 to Maximum Price Regulation 120 (Bituminous Coal Delivered from Mine or Preparation Plant), effective December 26.

Anthracite Strike Hurts Coal Production. Office of Solid Fuels Coordinator for War. Production statistics indicate that the recent strike of the anthracite miners cut more deeply into the supply of hard coal than previously estimated.

--TIMES-HERALD, WASH., D. C.

Hard Coal Flow East Slackens. Office of Solid Fuels Coordinator for War. Rail hard-coal shipments forwarded through New England rail gateways decreased approximately 27,900 tons during week ending January 9 as compared with previous week.

Joint Plan Cuts Coal Delivery Miles. Office of Defense Transportation. Approval of a joint action plan which will pare an estimated 135,000 truck miles annually off the delivery operations of 17 Chicago retail coal dealers through cooperative use of truck and yard facilities is announced by ODT.

Fewer Anthracite Reports in 1943. Office of Price Administration. Reports required from the anthracite coal industry by the Solid Fuels Branch of OPA will be reduced by 75 percent in 1943, mine operators are being advised in a letter from Gerald B. Gould, price executive for the solid fuel branch.

Anthracite Prices Up 50 Cents a Ton. Former Office of Price Administration. Administrator Henderson announced on January 6 an increase in maximum prices of Pennsylvania anthracite of approximately 50 cents a ton, in Amendment 10 to MPR 112, effective January 9.

Full, 6-Day Hard Coal Output Asked. Office of Solid Fuels Coordinator for War. Solid Fuels Coordinator for War Harold L. Ickes on January 8 called for immediate full production by nation's hard-coal mines on 6-day week to relieve tight hard-coal supply situation in New England and other Eastern States.

Anthracite Prices Advanced. Office of Price Administration. Price orders formerly authorizing the advance in Pennsylvania anthracite prices announced January 6 (OPA 1439) by OPA under Amendment 10 to MPR 112, became effective January 9, 1943.

Coal Mines' Repair Needs Urgent. War Production Board. U. S. coal mines expect to avoid serious curtailment of production only because of high priority ratings for emergency repairs just granted, the industry's representatives reported to WPB in Washington, in meeting on January 5 with Arthur S. Knoizen, Chief of Mining Equipment Division.

Soft Coal Price Revisions in Plan. Bituminous Coal Division. Bituminous Coal Division has instituted a proceeding for making such revisions in minimum soft-coal prices as may be found necessary under provisions of Bituminous Coal Act, Secretary Ickes announced on January 12.

East to Get Hard Coal Priority. Office of Solid Fuels Coordinator for War. Solid Fuels Coordinator Ickes announced January 14 anthracite coal industry has been requested to concentrate shipments into Eastern States in effort to ease growing fuel emergency caused by strike in hard-coal mines and fuel-oil situation.

NON-METALLICS

Voluntary Program to Cut Fluorspar Use Is Told. War Production Board. A voluntary conservation program to reduce consumption of fluorspar by steel producers some 10 to 15 percent is announced by the Fluorspar Section and the Steel Division of WPB, as a result of a meeting held in Washington.

Shipment of Fluorspar Controlled. War Production Board. Shipments by producers to users of metallurgical and ceramic grade fluorspar was placed under control January 7, through Priorities Regulation I.

Five War Minerals Restricted. War Production Board. Five non-metallic minerals (spodumene, kyanite, sillimanite, talc, diatomaceous earth) important in war production were put back under inventory restrictions of PR-1 by General Inventory Order M-161 on January 15, as amended by the Director General for Operations.

METAL

Nelson Commends Record Lake Ore Movement. War Production Board. Chairman Nelson commended the iron ore industry, the lake vessel industry, and all others who contributed to the record movement of 92,000,000 tons of iron ore from the Lake Superior District in 1942. This record exceeded by 3,000,000 tons the goal set at the beginning of the season.

Amended Vanadium Order Issued. War Production Board. An amended vanadium order, M-23-a, was issued December 26 by the Director General for Operations so as to bring within the framework of the order special directives which have been issued from time to time in the course of administering its restrictive provisions.

Magnesium Order Forms Simplified. War Production Board. Simplification of the magnesium allocation order, M-2-b, to bring it into line with the form of allocation orders now generally issued, was announced December 31. The amended order eliminates all references to preference ratings, inasmuch as the supply of magnesium and magnesium products is directly allocated to users.

Copper Scrap Imports Exempted. Office of Price Administration. Imports of copper scrap and copper alloy scrap by the Metals Reserve Company or its agents were relieved of price control by Amendment 3 to Schedule 20, effective as of November 1.

Ickes Reports On Alaskan Mining In 1942. Department of the Interior. Preliminary estimates made by the Geological Survey and announced by Secretary Ickes in a report on Alaskan mining for the year, indicate the mines in Alaska during 1942 yielded minerals to the value of $19,306,000.

Bureau of Mines Makes Annual Report. Department of the Interior. The U. S. produced more metals and minerals in 1942 than at any time in its history, Secretary Ickes stated on the basis of a year-end report from the Bureau of Mines.

Primary Chromium Purchases Simplified. War Production Board. Consumers of primary chromium are no longer required to file Form PD-54 with suppliers, but only with WPB under General Preference Order M-18-b as amended January 7, 1943. Users of less than 500 lb. of primary chromium chemicals a month are exempt from filing Form PD-54.

Strict Copper Control Necessary. War Production Board. Replying to recent published statements that copper supply adequate to all military and essential civilian requirements, H. O. King, Director of Copper Division, said on January 8 that the supply of copper is not adequate and never will be while war is on.

Tungsten and Molybdenum Orders Amended. War Production Board. Secondary tungsten and molybdenum chemicals were removed January 9 by the Director General for Operations from the M-Orders on tungsten and molybdenum. The orders amended are M-29 (tungsten) and M-110 (molybdenum).

Antimony Supply Depends on S. A. War Production Board. Antimony supply and requirement figures for 1943 reveal U. S. position depends upon South American imports, it was said at first meeting of Antimony Industry Advisory Committee in Washington with Erwin Vogelsang, Director of Tin-Lead Division, it was reported January 14.

1943 Lead Supply Drop Foreseen. War Production Board. Lead supply in 1943 expected to be below 1942 supply, the decrease being both in imports and domestic production, Director Erwin Vogelsang, of Tin-Lead Division, told Lead Producers Industry Advisory Committee meeting on January 14 in Washington.

Lead Regulation Revised. Office of Price Administration. Revision and amendment of the price regulation for scrap lead and secondary lead, and amendment of the price schedule for primary lead, were announced on January 16 by OPA through MPR 70 and Amendment 3 to RPS 69, both effective January 20.

Metallic Bismuth Fully Controlled. War Production Board. Metallic bismuth was put under complete allocation and use control by Conservation Order M-276, effective February 1, issued January 19 by Director General for Operations.

EQUIPMENT

Controlled Materials Plan B-1, B-2 Lists Made Public. War Production Board. Completion of the B-1 and B-2 lists of the Controlled Materials Plan is announced by Director Boeschenstein of WPB's CMP Division.

Simplification of Electric Motors Studied. War Production Board. Problems arising from scarcity of critical materials and the need for simplification and standardization in the electric motor industry were discussed at recent meetings of the Fractional and Integral Motor Industry Advisory Committees held with officials of WPB.

Mining Machinery Expansion Estimated. War Production Board. Mining machinery production could increase at once 20 percent with present plant facilities if manpower and materials were available, it was estimated on January 13 by Mining Machinery Manufacturers Industry Advisory Committee, who met in Washington.

Timely Return on CMP Forms Vital. War Production Board. Only manufacturers who meet time schedule of Controlled Material Plan in return of application blanks (CMP-4A and CMP-4B) will benefit by direct allotments of controlled materials during second quarter of this year, it was pointed out on January 16 by Harold Boeschenstein, Director of the CMP Division.

Mines Granted Higher Ratings. War Production Board. U. S. mines—metal, non-metallic, and coal—were granted higher preference ratings for purchase of repair and maintenance materials on January 7, 1943.

GENERAL

Dangers of Inflation Told in Pamphlet. Office of War Information. The disastrous effects which inflation would have on the conduct of the war, and the steps by which the people themselves can forestall runaway prices, are described in a pamplet, "Inflation," issued by OWI.

YOU'LL FIND YOU CAN SEE THINGS MORE CLEARLY WITHOUT ALL THIS LONG GREEN HANGING IN YOUR EYES!
VICTORY TAX
EVERYBODY'S PAY ENVELOPE
SAM'S
SALT LAKE TRIBUNE

Labor Is Plentiful in 85 Industrial Areas. War Manpower Commission. Eighty-five industrial areas are tentatively designated by WMC as plentiful labor areas and listed in Group IV of a revised classification issued for guidance of WPB and Government procurement agencies in placing war contracts with consideration for manpower factors.

Manpower Wastage Causes Concern. War Production Board. Outlining necessity for nation-wide effort to stop wastages of manpower in war industry now being caused by preventable accident and illness, Labor Production Division Director Lund told Council on Industrial Health of American Medical Association in Chicago that management and labor should share responsibility in industrial hygiene programs.

PARMANCO Horizontal Drills

PARMANCO Horizontal Drills are used exclusively in the Iron Range for horizontal drilling.

They are also used by a large percentage of the strip coal mines.

The new PARMANCO Vertical Drill has revolutionized test drilling.

Write us your drilling problems.

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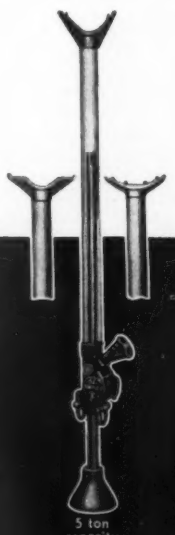

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with Simplex Mine Timber Jacks. It's a job to lift and hold a timber in place without trying to hold up tons of tender slate and rock. Wood or steel beams are held safely in place with Simplex Mine Timber Jacks until Simplex Adjustable Roof Supports or posts can be spotted.

Two models—screw and ratchet lever style, both available with three types of heads. No. 32 is a first class post puller, too. Bulletin "Mines-42" tells all.

Templeton, Kenly & Co.

Better, Safer Mine Jacks Since 1899

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Make Your Jacks Last Longer!

Proper lubrication, care and handling will do it. Send today for a bulletin on the care of jacks.

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LEVER · SCREW · HYDRAULIC

Jacks

PERSONALS

Howard I. Young on January 30 was appointed Director of WPB's Minerals Resources Coordinating Division. Mr. Young was also appointed chairman of the newly formed Mineral Resources Operating Committee and the Minerals and Metals Advisory Committee. He will coordinate the activities of 12 governmental agencies concerned with providing the essential minerals and metals for the war program. Mr. Young's Washington address is Room 1106, Tempo "R."

Mr. Young has spent most of his career in the mining industry. He started in the Joplin field in 1906 and became associated with the American Zinc, Lead and Smelting Company two years later. In 1914 he was placed in charge of the company's mining operations in Missouri, and in 1919 he became general manager of all mining operations. He was made vice president in charge of mining and smelting operations in 1928 and since 1930 he has been president and general manager of the company. He is president of the American Mining Congress and the American Zinc Institute and a director of several companies, including the Baltimore and Ohio Railroad and the Southwestern Bell Telephone. He also is a director of Washington University, St. Louis.

Charles V. Harris, who has been division engineer with International Minerals and Chemical Corporation at Mt. Pleasant, Tenn., has been transferred to Bartow, Fla., where he is metallurgist for the new Peace Valley phosphate operation of International.

Frank Riddell has been appointed superintendent of Christopher No. 5 mine of the Christopher National Coal Company, Morgantown, W. Va.

H. W. Clarke, who resigned recently as vice president of McGraw-Hill Publishing Company, Inc., and publisher of "Coal Age," "Engineering and Mining Journal" and affiliated mining publications, has leased offices in the News-Week Building, Times Square, New York City, and will announce new plans and associates in the near future.

Paul Dyer Merica, vice president of the International Nickel Company, and **Essington Lewis**, director general of Aircraft Production and director general of munitions for the Commonwealth of Australia, have been elected honorary members in American Institute of Mining and Metallurgical Engineers.

At the annual meeting of Roberts and Schaefer Company, held at Chicago, Ill., January 25, 1943, **R. T. Middleton** was elected to the office of vice president and director. **William C. McCulloch**, preparation manager, was made a director of the company.

Clarence Spragg has been appointed superintendent of mine No. 97 of the Consolidation Coal Company, Rivesville, W. Va.

G. A. Joslin, mining engineer, Los Angeles, Calif., has been appointed consultant to the Metals Reserve Company, succeeding the late Robert Linton. He will continue his private consulting practice with office at 311 Financial Center Building, San Francisco.

Paul Morton has been named production engineer for the Winifrede Collieries, Winifrede, W. Va.

Announcement was made on January 1 by **D. M. Kelly**, vice president of the Anaconda Copper Mining Company, that **Roy H. Glover** of Great Falls has been appointed head of the legal department of the Anaconda Company at Butte, under **W. H. Hoover**, general counsel. Mr. Kelly also announced the appointment of **Robert E. Brooks**, superintendent of the B. A. & P. Railway, to be general manager of the road succeeding the late Harry A. Gallwey. Mr. Brooks also was elected a member of the board of directors of the railway company.

Percy E. Barbour has been attached to the American Embassy at Lima, Peru. He has been granted a wartime leave of absence as secretary and treasurer of the Mining and Metallurgical Society of America.

Thomas L. Wells, editor of *The Explosives Engineer*, has been given a leave of absence to join the United States Marine Corps as a Volunteer Specialist. He has received a commission as first lieutenant.

William M. Lacey, formerly general superintendent of coal mines for Republic Steel at Sayreton, Ala., has gone to McAlester, Okla., as project manager for the McAlester Fuel Co.

James O. Greenan, Nevada mining engineer, is operating the Greenan-Kerr tin property in northwestern Nevada. This was formerly known as the Majuba Hill mine. Reported rich tin ore in this vicinity was only recently discovered. Mr. Greenan has stated the ore now ready for shipment contains more metallic tin than the total produced heretofore in the United States.

H. G. Hymer, for the past five years mining engineer with the General Chemical Company in New York, is now associated with the Reconstruction Finance Corporation in Washington as an evaluation engineer. While with General Chemical, Mr. Hymer conducted development work of fluorspar deposits at Deming, N. Mex., Boulder, Colo., and other localities. He was previously engaged in copper mining in Arizona and northern Rhodesia.

D. K. Scott has been appointed superintendent of No. 4 mine of the Pond Creek Pocahontas Coal Co., Bartley, W. Va.

George H. Harbordt, who resigned as vice president and general manager of Cia. Minera de Penoles, Monterrey, Mexico, is now serving as consulting engineer for the company.

Orrin T. Barrett has been named preparation engineer for the Guyan Eagle Coal Co., Amherstdale, W. Va. He was formerly connected with the Pittsburgh Coal Company as assistant to the preparation engineer.

Richard S. Newlin has joined the staff of Anaconda Copper Mining Company in New York. He was formerly general superintendent of Inspiration Consolidated Copper Company at Inspiration, Ariz.

H. M. Hanna, George M. Humphrey, and **H. L. Pierce,** officials of The M. A. Hanna Company of Cleveland, recently inspected operations of the Manganese Ore Co., Hanna subsidiary, operating a pilot mill in Berkeley, Calif., and a manganese pit mine near Las Vegas, Nev.

A. A. Hoffman has left Berkeley, Calif., for Preston, Cuba, where he is connected with the Nicaro Nickel Co.

Lysle E. Shaffer has recently been transferred from Tucson to Moscow, Idaho, by the U. S. Bureau of Mines.

At a meeting of the Board of Directors of Nickel Plate Road **John W. Davin** was elected president of the New York, Chicago & St. Louis R. R. Co., effective December 16, 1942, succeeding George D. Brooke, who has retired after a distinguished administration. Mr. Davin was formerly a vice president of the Chesapeake and Ohio Railway Company and assistant to the president of Pere Marquette Railway Company. He will maintain headquarters in the Terminal Tower, Cleveland, Ohio.

G. Donald Eberlein is now a junior geologist of the U. S. Geological Survey, Washington, D. C.

Arnold B. Landstrom has been named superintendent of the Isle Royale Copper Company stamp mill at Houghton, Mich.

Joseph E. Ward, until recently with the Tennessee Coal, Iron & R. R. Company, is now in Hazleton, Pa., as sales representative for the Mine Safety Appliances Co.

Edwin A. Friedman, assistant superintendent for the Oliver Iron Mining Company in the Canisteo district, has been made general superintendent, with headquarters at Coleraine, Minn.

Russell Haworth is now located at Carlsbad, N. Mex., where he is employed in the engineering department of the Potash Company of America. He was formerly managing engineer for Nielson & Company in Seattle.

Joseph A. Norden, manager of the National Tunnel & Mines Co., Bingham Canyon, Utah, is now in Vermont. He is to bring the Elizabeth copper mine, located near South Stafford, back into production.

Hiram Shafer has been appointed superintendent of Milburn Nos. 1 and 2 mines of the Milburn By-Products Coal Company, Milburn, W. Va.

Robert L. Thorne, formerly with the Alaska Juneau gold mine, is now on the staff of the U. S. Bureau of Mines in Juneau.

O. W. Trumbull, formerly of Asbestos Textile Co., is now connected with Greene, Tweed & Company of New York and was appointed vice president and general manager of the corporation at a recent meeting of the board of directors.

Russell T. Cornell, mining engineer with the St. Joseph Lead Company, is now located at the Aguilar lead-zinc mine in Argentina.

John R. Shoffner was recently elected State Director on the Executive Board of the Pennsylvania Society of Professional Engineers representing the Pittsburgh Chapter. Mr. Shoffner is associated with various coal mining companies in Kittanning, Pa.

Hugh P. Nicholson has resigned from the faculty of the department of mining engineering at the University of Illinois to become president and manager of the Chestnut Hill Zinc Co., Galena, Ill.

George A. F. Deshler has left the Krome Corporation, Oregon, and is employed by the Goodyear Aircraft Corp., Phoenix, Ariz., as junior metallurgical engineer.

Malcolm H. Carpenter has been transferred to Denver as Regional Chief, Industrial Salvage Section, Conservation Division of the WPB.

— *Obituaries* —

William Frazier Tams, for many years general manager of Gulf Smokeless Coal Company, died on Tuesday, December 22. He was 61 years old.

Mr. Tams' death was the result of a chest injury occasioned when he was caught in one of the tipple conveyors at No. 2 mine.

Dr. Henry Mace Payne, 65, mining engineer and industrialist, died on January 7, at his home in Los Angeles, Calif. A graduate of McGill University, Montreal, Dr. Payne was well-known throughout the mining field and had served as field secretary for the American Mining Con-

gress. For several years before the Russian revolution he was chief geologist for the Russian government. Recently he had operated a metal alloy company in Burbank, Calif.

Gilbert Rogers Kittle, for many years president and general manager of the Jeffrey Manufacturing Company, died on Tuesday, December 15. He was 69 years old. Mr. Kittle, with two associates, promoted and started the Ohio Malleable Iron Company, in 1902, which company was sold to Jeffrey Manufacturing in 1905. He was retained by the latter company as superintendent, which title was later changed to general manager, and in 1923 he was elected president.

He is survived by his widow, Mrs. Grace Reese Kittle; a daughter, two grandchildren and a brother.

Roy H. Clarke, 73, Spokane, Wash., died January 21 in Wardner Hospital in Kellogg from injuries suffered in a fall down the shaft of the Linfor Copper mine. He was one of the most prominent mining engineers in the Pacific Northwest. Mr. Clarke was a former president of the Northwest Mining Association and was long active in its affairs.

Dr. Harry A. Garfield died early in December in his 79th year. He was U. S. Fuel Administrator during the last war, having been appointed by President Wilson in August, 1917. Prior to that service he was president of Williams College, which presidency he reassumed after World War I, becoming president emeritus in 1934. His passing is a real loss in the field of education as well as to his host of friends in the coal industry.

Herman Stabler, 63, executive for the U. S. Geological Survey in Washington, with which organization he has been associated since 1903, died November 24.

"To the FUTURE!"

★ YUBA DREDGES are favorably known and have been used throughout the world for many years. Long standing personal and business friendships were built up thereby, making every member of Yuba's organization keenly aware of the global nature of this war. They are personally interested because of their direct acquaintance with dredgemen in many of the countries affected. "Business as usual" is temporarily a thing of the past, for reasons which they also understand fully, and which are results of enemy action and domestic economic rulings.

★

★ "What to do about it?" The answer is simple. Everything possible to win the war and to do it quickly! That is the Yuba spirit and intent. After the war, again there will be new Yuba dredges, designed and built by a company having access to widely varying, actual field experience. We send greetings and best wishes to Yuba friends wherever they may be, with the sincere hope that, in the not too distant future, every placer dredge again will be swinging and digging as usual, to the sounds of ringing metal, groaning bucket lines and splashing water which are music to the dredgeman.

★ When the time comes again, Yuba dredges and parts will be of the same high standard as in the past, but also designed to do the jobs of the future. Many dredging areas will have to be re-appraised and new plans made to mine them economically and profitably. Let Yuba help in the design of your future dredge or in rebuilding and re-equipping your present one.

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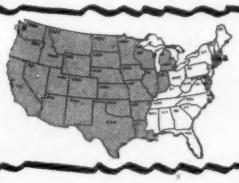
News and Views

Eastern States



WEST VIRGINIA

»»» Out of a whirlpool of uncertainty the application of the victory tax has finally reached the peaceful calm of conditions that the social security taxes have enjoyed for several years. When the tax was first announced as collectable, the Internal Revenue Department announced it would apply to gross income, ignoring a previous ruling that for miners, explosives, smithing charges, electric cap lamps, hard-toed shoes, protective hats, and a number of tools were not wages under the Social Security Act and were not, therefore, taxable. The deduction of such items from gross earnings brought about a net gross income upon which the social security tax was applicable. Reversing the original decision to apply the victory tax to "gross" income, the Revenue Bureau agreed to allow the items not considered to be wages for social security tax purposes to likewise be considered as not being wages for purposes of the victory tax application. This may be illustrated by a miner who has made an earning of $75, but has expended $4 for explosives, 35c for smithing, 65c for cap lamp service. The tax is active upon the net gross, or $70, which is the amount upon which his social security tax of one percent is based.

The second reversed opinion concerns the wages upon which the victory tax was to apply. The original decision indicated the tax was applicable to wages paid after January 1, 1943, although earned in 1942. It was pointed out by a number of substantial representatives of the coal industry, and possibly others, that wages earned in the early part of a month were available and constructively paid, although not actually paid in cash until some date in the second half of the month. These presentations evidently were sound and are witnessed by the belated decision from the Revenue Bureau that wages for December, 1942, were not subject to the victory tax as first proclaimed.

»»» An unusual transaction was completed on December 15, 1942, when the American Rolling Mill Company purchased the stock of the Colcord Coal Company at Montcoal, W. Va., with full operating privilege. The Colcord Coal Company was operating two well-known seams, namely, Dorothy and Hernshaw. The new management will open the No. 5 Block in addition to these as soon as it can be accomplished. The new ownership will be under the control of C. W. Conner as general manager of Armco Coal Division and first vice president of the new operating company.

»»» So far there has been no loss of operating time in Kanawha District from car shortage, but there are many who believe the introduction of the six-day week would have a direct bearing upon the car situation.

PENNSYLVANIA

»»» The Tasa Coal Company of Zelienople, Pa., has taken up a number of leases on the Upper and Lower Freeport seams of coal in the vicinity of Smith Mills, Clearfield County, Pa., on which they expect to commence stripping immediately. The coal will be loaded over the Waverly Mine tipple formerly operated by S. J. Mountz & Company. The operations are expected to have a capacity of 500 to 1,000 tons per day.

»»» John F. Foreman, formerly general superintendent, Sterling Coal Company, Elmora, Pa., is planning to go into business for himself operating strip pits in the vicinity of Windber, Pa., where he has leased several tracts of high-grade Lower Kittanning seam coal.

»»» A meeting of Mine Victory Coal Production Committees was held in the Masonic Temple, Johnstown, Pa., December 30, 1942, in connection with the Treasury Department's 10 percent payroll saving plan. The Central Pennsylvania Victory Coal Production Committee, Altoona, Pa., has been selected by the Treasury Depart-

To Mining Congress Journal Readers

Conservation of materials as an aid to our war program has been extended by recent WPB rulings to certain commercial uses of paper. In cooperation with this program, a slight reduction will be made in the "trim" or overall size of MINING CONGRESS JOURNAL beginning with the March issue.

Our editorial content per page will remain exactly the same, the size reduction being accomplished by a small cut in the page margins. We are glad to have this opportunity to add another "mite" to the war effort.

ment to handle this drive with its local mine production committees.

The plan was explained by William H. Kern, Associate Administrator, in charge of labor relations, Treasury Department War Savings Staff, of Philadelphia, and B. W. Deringer, production manager, The Central Pennsylvania Coal Producers' Association, and Clarence Donaldson, production manager, United Mine Workers of America, Altoona, Pa.

»»» Reports required from the anthracite coal industry by the Solid Fuels Branch of the Office of Price Administration will be reduced by 75 per cent in 1943. Plans now call for a quarterly report ending March 31, June 30, September 30 and December 31, 1943, rather than the monthly statement which had been worked out by the industry itself prior to the issuance of the solid fuel price regulations. The reports include production and cost data which OPA uses in determining maximum prices, price adjustments and trends.

NORTH CAROLINA

»»» Men are digging, drilling and prospecting in North Carolina like they never have before in an effort to extract and find minerals for the war industries, Dr. J. L. Stuckey, state geologist, revealed in a summary prepared for the Board of Conservation and Development at its January meeting.

The report revealed that manganese already is being mined in Alleghany County on a small scale; that the RFC has advanced money for new copper prospecting in North Carolina; that there is "fair prospect" for reopening the state's old corundum mines; and that the long-awaited exploitation of the state's spodumene deposits is under way. The coal deposits centering around Sanford, which have produced in past years, are now being explored and old shafts cleaned. Some coal already has been taken out.

Other developments of the year included mining of olivine for refractory purposes and renewed interest in this mineral as a source of metallic magnesium; the increased production of vermiculite; the phenomenal increase in mica production and prices; and "significant" renewed interest in the state's iron deposits because of the proposal to resort to sponge iron as a remedy for the metal shortage.

The division is attempting now to have a survey made of the state's iron fields, which have not been worked for several years. In addition to these minerals, the state in 1942 produced talc, pyrophylite, feldspar, kaolin, quartz, marble, gravel and clays. Dr. Stuckey estimated the total value of minerals produced in North Carolina this year would be among the largest in the state's history.

»»» Herman A. Brassert, noted metallurgist, told members of the North Carolina Legislature in a recent meeting called by Governor J. M. Broughton to discuss the possibilities of exploiting mineral deposits; that North Carolina has sufficient and suitable iron ore and plenty of coal with which to make sponge iron. Mr. Brassert has been commissioned to build the $450,000 sponge iron pilot plant for the Republic Steel Company at Warren, Ohio, the first such plant in this country. He was invited to North Carolina to take a look at this state's iron and coal resources.

He pointed out that North Carolina's iron ore is of sufficient quality and quantity to be used economically for making high-grade metal; there are at least 65,000,000 tons of coal recoverable in this state; the sponge iron method of extracting metal is relatively inexpensive and speedy in comparison with the present cumbersome blast furnace method; gas, derived from North Carolina coal, will be a valuable by-product of the operation, since it emerges from the ore better in heating and illuminating qualities than when it entered; other by-prod-

OUT IN FRONT . . .

In the recovery of critical minerals Super-Duty Diagonal Deck No. 6 Concentrating Tables are being used exclusively at many of the new tin, chrome, tungsten, vanadium, manganese and other mines throughout the U.S.A. and United Nations.*

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ucts would be plastics, pharmaceutical products and fertilizer.

Allen Forsberg, special representative of the Congressional Steel Shortage Committee, spoke after Brassert, explaining the committee's interest in sponge iron sprang from a determination to get metal for war production. It was emphasized, however, that the sponge iron development was predicated upon a peacetime economy as well as wartime markets.

»»» The first car of coal to be mined in North Carolina in almost two decades was shipped from the Carolina mine in Chatham County late in January. The coal is being tested in fireboxes of the Atlantic and East Carolina Railway's locomotives.

»»» Substantiating reports that reopening of the old Deep River coal field is a serious effort to put the state back into the coal-producing list, H. B. Chatfield, Southern Pines, N. C., associated in the venture, said the mine would be completely rehabilitated. Work of cleaning out the coal mine shafts has been underway for several months. They were abandoned several years ago after a coal damp explosion. Attention has been focused on the mines since it was revealed that a bed of iron ore lies beneath the coal vein. Presence of the iron ore was noted some years ago in a geological report, which called the circumstance "a rare one."

ALABAMA

»»» More than 60 new by-product coke ovens were put into operation at the Gadston plant of the Republic Steel Corporation on January 15. Coke for the company's blast furnaces has thereby started increasing the production of rough steel.

»»» The first coal from the Tennessee Coal, Iron & Railway Company's new mine (Short Creek No. 19), near the Warrior River and Short Creek, were loaded and shipped December 7, the first anniversary of Pearl Harbor. Work on this Birmingham district property started last March and it represents an investment of $2,000,000. When production capacity is reached some time late this summer between 600 and 700 men are expected to be employed. Output at that time is expected to reach 3,500 tons of coal per day. A modern coal washer, shops, offices and houses for key employes constitute the new surface buildings. The most modern mechanized coal mining equipment is being used underground and a feature of the operations is the bringing of coal to the surface by conveyor belt installations.

»»» The Sloss-Sheffield Steel & Iron Company, operators of iron ore and coal mines and four blast furnaces in the Birmingham area, has been acquired through purchase by the United States Pipe & Foundry Company. This transaction gives U. S. Pipe & Foundry access to its own

if the installation of a washer would release vital manpower by eliminating men now used for hand picking coal...
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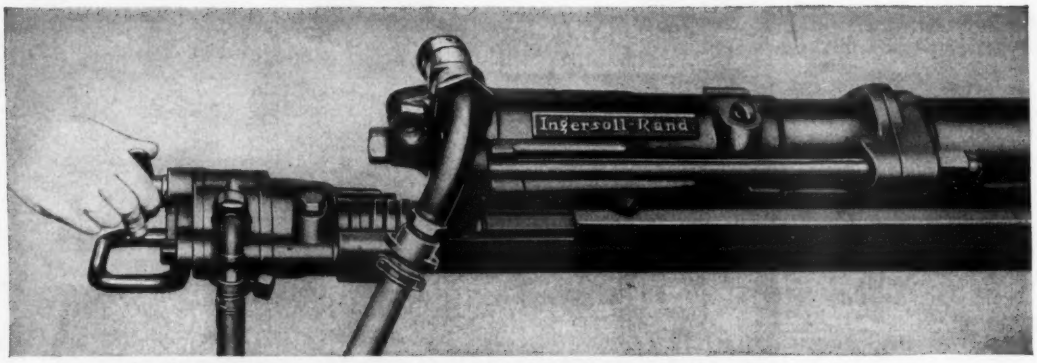

The PF-2 Power-Feed is safe. The controls are stationary so that the operator's hands are out of danger.

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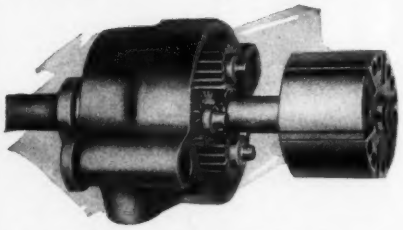
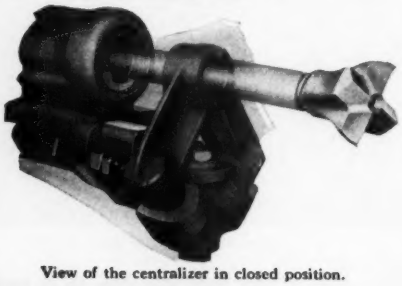
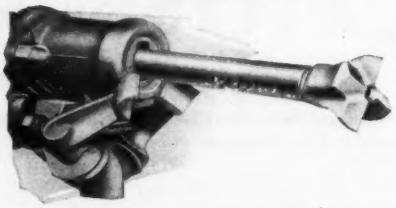
will help you MINE MORE ORE



The Power-Feed's simple method of gearing provides a dependable feeding action.



View of the centralizer in closed position.



The centralizer arms are being pushed into open position by the forward motion of the drill.

1 There are 3 sizes of Ingersoll-Rand Drifters available for mine service. They have broken drilling records in all parts of the country. These proven time-savers will help you mine more ore because you can select the machine that will drill your rock to best advantage.

2 The I-R Power-Feed located on the back end of the drifter shell provides safety and ease of operation. It reduces time lost in the drilling cycle. Steel changes are made much more rapidly. The drill operator has greater freedom and is less fatigued at the end of the shift. There is no let-down in the rate of drilling. Forty different positions on the feed throttle permits the proper adjustment for any kind of rock. All these factors lead to greater footage per man shift.

3 The compact, durable I-R drill steel centralizer facilitates the starting of holes. It is fitted to the end of the shell and holds the drill steel in its proper position. This centralizer is so designed that its arms are automatically opened by the fronthead of the drill as the machine feeds forward in the shell—the operator does not have to open it. Since this centralizer keeps the steel from wobbling or jumping around, holes can be collared safely and easily by one man. This speeds up the round thereby aiding the production of vital ore.

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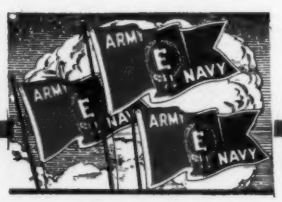

All plants of Ingersoll-Rand Company are flying the Army-Navy "E" awarded "for high achievement in the production of war materials."

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The operator can raise or lowe
head at will—he can follow the
of the mine with ease. In low
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NASHVILLE ILLINOIS

raw material. The four blast furnaces operated by Sloss-Sheffield Steel & Iron Company are in and near Birmingham. The combined capacity is estimated to be around 600,000 tons annually. U. S. Pipe & Foundry Company has plants in North Birmingham and in Bessemer employing around 2,000 men in the production of pig iron and other materials for the war program.

NEW YORK

»»» The war has stimulated mining in the Adirondack Mountain region of the Empire State to a degree few would have realized a quarter of a century ago. In addition to lead, zinc, iron, ilmenite the titanium bearing ore, and magnetite being produced, deposits of graphite, mica and other minerals are being examined. The lead-zinc mines of the St. Joseph Lead Company in New York State have been in operation for some time, whereas the production of iron ore and ilmenite from more recent prospected and developed properties constitute the feature of current activities.

At Lyon Mountain in the northern part of the State, the Republic Steel Company has known iron ore reserves totaling around 80,000,000 tons. Additional production facilities are being installed near Port Henry by the company.

Large deposits of iron ore are also being developed by the Jones & Laughlin Steel Corporation at the Old Benson property, which had been closed for many years.

The Clifton magnetite deposits and mines in St. Lawrence County have been developed and rehabilitated, respectively, by the M. A. Hanna Company, Cleveland, Ohio. The beneficiation and sintering plants are now producing a sintered magnetic iron ore in substantial quantities. The operating company is known as the Clifton Ore Co., Inc., George M. Humphrey, president.

To provide the war program with titanium for making the most opaque white paint known, the National Lead Company acquired in 1941 both the Sanford Mountain deposit containing beds of titaniferous iron and the Iron Mountain deposits. Following construction of a modern highway and rehabilitation of the mines, production of titanium bearing concentrates from its new plant started in July last year. The property is somewhat isolated and housing facilities consisting of a modern dormitory and a village of more than 40 units have been built.

Open cut mining is practiced, employing electrically operated 3 cu. yd. shovels. Ore is brought to the mill by a fleet of heavy-duty trucks consisting of two 30-ton Macks and six 15-ton Euclids. Rock is crushed in a primary Birdsboro-Buchanan 48 x 60 in. jaw crusher. Symons short head cone crushers reduce the product to ½ in. before fine grinding. Marcy open-end rod mills perform the fine grinding and Crockett magnetic separators separate the magnetite from the ilmenite and waste rock. Fahrenwald classifiers produce the sand products, two of which are fines, with ore further separated by tabling. Twenty-one Wetherill magnetic separators produce the desired product of ilmenite containing about 48 percent titanium oxide.

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ABC Jute brattice cloth is playing an important part these days in getting the air to the "working front."

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flame — ABC cloth has the benefit of much research and actual test in order to secure the best known flame resistant chemical treatment.

fungi — The chemicals used in our treatment form a compound which will resist the many types of fungi found in some mines.

leakage — Our high specifications mean a closely woven cloth from heavy Jute yarns, assuring you of working places well ventilated.

shrinkage — Moisture found in many mines will not cause shrinkage of ABC Jute; therefore you are "playing safe" when using ABC Jute because no air can escape underneath the curtains.

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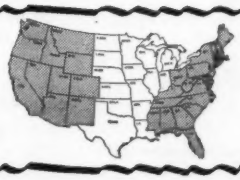
Central States



- - U. S. BUREAU OF MINES

Motorman feeding train of iron ore onto an underground car dumping device

ILLINOIS

»»» Supplying vitamins to correct nutritional deficiencies among employes is now a national movement, in which executives of industrial concerns in all lines, large and small, are taking the lead. This is action on the slogan, "U. S. Needs Us Strong."

Coal miners in Williamson County, Illinois, are reported to be among the first to benefit. The Freeman Coal Mining Corporation, operating mines near Herrin, recently concluded arrangements with Vitamins Industrial, 222 North Bank Drive, Chicago, for the regular distribution of multi-vitamin tablets among all its 600 miners.

Thus the men whose work takes them away from the sunlight much of the time will receive not only the "sunlight vitamins," but all the other vitamins known to be essential.

President J. Roy Browning of the Freeman Corporation expects this program to decrease accidents in the mines, as well as to increase the health of the miners, and their enjoyment of life after work-hours.

OHIO

»»» Mine Inspectors' Institute of America will meet on Monday, Tuesday and Wednesday, May 24, 25 and 26, at the Deshler-Wallick Hotel, Columbus, Ohio, for its 34th annual convention, to discuss safety in mining operations. C. A. McDowell, 427 Park Street, California, Pa., is secretary.

SOUTH DAKOTA

»»» Homestake Mining Company, of Lead, S. Dak., is preparing to mine and process vanadium ores in Southern Idaho in co-operation with the Metals Reserve Corporation. The Homestake is operating through a subsidiary known as the Wyodak Coal & Manufacturing Company. Scene of operations is near Montpelier, Idaho, close to the Idaho-Wyoming state line and is a result of U. S. Bureau of Mines and U. S. Geological Survey investigations of the vanadium content of Idaho phosphate beds. Anaconda Copper Mining Company has had a large phosphate property in operation at Conda, Idaho, for several years and has recently started production of vanadium as a by-product.

MINNESOTA

»»» The Minnesota Safety Council held its annual meeting in St. Paul, January 12. A. V. Rohweder of Duluth was reelected president. Among the mining companies awarded flags for outstanding safety records were Evergreen Mines Co. on the Cuyuna Range, Crosby, Minn., and the Charleson Iron Mining Co., Hibbing, Minn.

»»» Butler Brothers of St. Paul, Minn., have a prospecting program under way on the Mesabi Range, on the Gilpin Reserve and Gilpin Tehan Reserve. The S. E. Atkins Co. of Duluth is conducting the drilling.

Correction: In the article, "The Dustless Treatment of Coals with Materials Other Than Oil," December, *Mining Congress Journal*, by Ralph Sherman and George W. Lamb, we inadvertently omitted to mention that this article was abstracted from Information Bulletin 4 of the Bituminous Coal Research, Inc.

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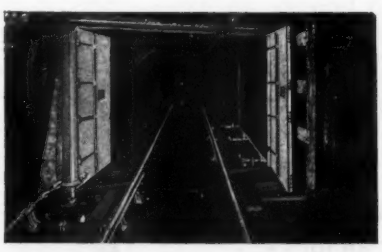

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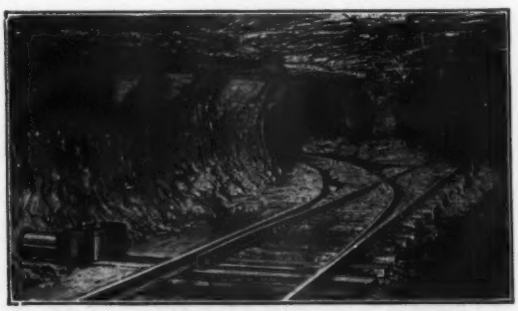
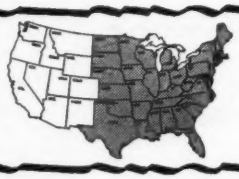


THE AMERICAN MINE DOOR COMPANY . . . . . 2063 DUEBER AVE., CANTON, OHIO

Western States



ARIZONA

»»» Extensive search for deposits of mica, quartz, and optical calcite, new minerals listed as strategic in the war effort, has been started in Arizona by the U. S. Bureau of Mines' southwestern experiment station at the University of Arizona. Recommendation for development will follow their location and examination, and a great many finds may result from notification to the bureau by Arizona prospectors and miners of localities in which the minerals have been found, it is said by J. H. Hedges, director of the Arizona offices.

Mica of the block and punch type, free of black and red spots or cracks, pin-holes, cross-grains, reeves or ribs, is needed. It should be hard, clear, and reasonably flat, enabling it to be easily and evenly split. Demand is for pieces 1½ by 2 in. up to 2 by 3 in. in size. Optical calcite, also known as Iceland spar, is wanted only in the crystals, and they should have a high degree of transparency, although tinting is not objectionable, Hedges said. Quartz crystals must weigh more than ½ lb., be water clear, and at least 30 percent of its volume must be free from cracks, bubbles, fractures, flaws and needles.

»»» Deposits of low-grade copper ore in northeastern Arizona on the Navajo Indian reservation, reported by the Arizona Department of Mineral Resources, are believed to hold the possibility of producing more new copper in less time and with less capital expenditures and less critical materials required than any other known deposit in the nation. J. S. Coupal, director of the state mineral department, in reporting on the survey and initial development, said that the area extends eastward into New Mexico, and then north into Utah.

Preliminary mine development and milling is being done by the Mardun company. The 75-ton pilot plant is north of Cameron. Results of drilling and ore concentration tests made by the Shattuck Denn Mining Corporation of Bisbee are being tabulated.

Average grade of the copper in the sandstone bed is about 0.7 of one percent, with localized areas going much higher.

»»» Leviathan mine, a molybdenum property in the Cedar Valley mining district of Mohave County, near Copperville, is to resume operations under an RFC loan. Along with other mines of Cedar Valley, the Leviathan mine is now within easy reach of Phoenix shipping facilities, over a new road constructed from Sandy Road to Copperville. The mine was a heavy producer during the previous World War, but closed when the price of molybdenum dropped to a low level.

»»» What is said to be an important strike is the report by the United Lead-Zinc Mines, Inc., of Mohave County, in the Columbus and Lead group of mines 16 miles from Kingman, of a new body of lead-zinc gold-silver ore. The deposit is about a mile off the Sandy Road, and in the northeast end of the Hualpai Mountains. The ore body is traced along the surface for a distance of over 500 ft., and is exposed by open cuts and shallow tunnels. The carbonate ore was first broken into at a point about 150 ft. in a tunnel. Men are engaged in cleaning out and timbering the tunnel.

More Mining Companies Will Receive Army-Navy "E" Award

Selection of a new group of 35 industrial establishments to receive the Army-Navy Production Award for outstanding performance on war work was announced late in December by Undersecretary of War Robert P. Patterson and Undersecretary of the Navy James V. Forrestal. Among those selected in the mining industry are Anaconda Copper Mining Co., Anaconda, Mont.; Anaconda Copper Mining Co., Anaconda Reduction Works, Great Falls, Montana; Pittsburgh Coke and Iron Co., Neville Island Plant, Pittsburgh, Pa.; Tennessee Coal, Iron and Railroad Co., Bessemer Rolling Mill, Bessemer, Ala.; Tennessee Coal, Iron and Railroad Co., Ensley Works, Ensley, Ala., and Tennessee Coal, Iron and Railroad Co., Fairfield Steel Works, Fairfield, Ala. Each of the selected plants will be privileged to fly the Army-Navy Production Award Pennant and all of their civilian employes will be awarded Army-Navy "E" pins.

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UTAH

»»» Development work at the Mercur Dome property, situated in the old Mercur district of Utah, is being watched with interest. A 1,200-ft. shaft has been completed and lateral development is about to begin. The objective is to explore the ore possibilities of the Madison limestone, which has proved productive at the Hidden Treasure property in the Dry Canyon district about five miles north of Mercur. The old Mercur or Camp Floyd district, as it was known in the early days, was primarily a gold producer with a record of approximately $50,000,000 in production. The Mercur Dome company, however, is seeking to determine the lead-zinc possibilities of the Madison horizon in that area. Leon Neuren, Knight Block, Provo, Utah, is secretary of the Mercur Dome company.

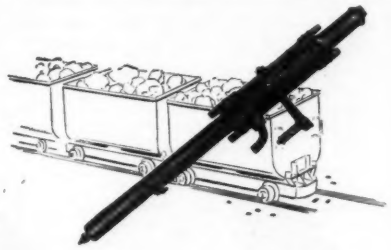
»»» A showing of high-grade copper-lead-zinc carbonate ore has been encountered in the Kentucky-Utah property, situated in the Big Cottonwood mining district, about 26 miles southeast of Salt Lake City. The company recently entered its long-sought objective of favorable territory after a development campaign which has been conducted intermittently over the last 12 years. The property extends from the Big Cottonwood district over a range of mountains into the Alta district. Years ago a tunnel was started from the Big Cottonwood side to prospect for the downward extension of ores found in the upper workings of the old Woodlawn mine, which is now a part of Kentucky-Utah property.

»»» Utah Copper Company, winner of the Army-Navy E award, broke all existing production records for a single mine in 1942. While records of production and copper content of the ore is censored, it can be said that the Utah Copper is moving 90,000 tons of ore daily to the company's two milling plants. In addition this much and a little more waste is being mined from the copper pit at Bingham Canyon, Utah. Such a record was unthought of prior to the war and is an indication of the excellent contribution being made by the company in an effort to meet the increasing tempo of America's war effort. Before the war the best record was 75,000 tons of ore per day. The mine is under the direction of D. D. Moffat, president and general manager. Mr. Moffat was named president upon the retirement of D. C. Jackling last November.

«««Park City Consolidated Mines Company has halted work at its property in the Park City mining district, Utah. Increased wages and pumping costs made further mining of its silver ore uneconomical. The company is concentrating attention on the development of a lead prospect in the Tri-state district of Missouri. There a 400-ft. shaft has been completed and drifting will soon start toward an ore bedding proved by diamond drilling operations. Allan Reiser, Park City, Utah, is general manager.

»»» Production of copper ores from the National Tunnel & Mines Company at Bingham, Utah, is being stepped up rapidly and has surpassed the rate of 600 tons per day. Company officials expect to increase production to 1,000 tons per day in the near future. Entrance of this mine into the class of large-scale producers culminates a program of development and deep exploration that required more than four years and the expenditure of $1,500,000.

The National Tunnel and Mines is not a new producer, it is a consolidation of two old producers of the Bingham district—the Utah Apex Mining Company and Utah Delaware Mining Company. Shortly after the consolidation in 1937, a program was launched to tap known ore reserves below the



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water table, reserves that were not commercial because of pumping and hoisting costs.

Under the original estimates, the company believed that about $1.40 per ton could be saved by a deep drainage and transportation tunnel. The tunnel was driven from the Tooele side of the Oquirrh range of mountains into the Bingham property, a distance of 4½ miles. The tunnel encounters the Rood shaft of the Utah Apex unit at a depth of 2,500 ft., 800 ft. above the lowest workings of the mine. Completion of the tunnel early in 1942 was only part of the job. Since that time the company has been engaged in unwatering and repairing below the 2,500-ft. level, and only within the last month has the company been able to turn out any sizeable production.

»»» The United States Bureau of Mines has started development of the property of the Cupric Mining Company, situated in the San Francisco mining district, Beaver County, Utah, with the object of exploring the sheelite ores found near the surface, and in diamond drilling. Work is under the direction of James A. Marsh, district engineer for the bureau in the Utah-Wyoming area. A tunnel has been driven approximately 80 ft. and already showings of sheelite have been encountered, Mr. Marsh reports. The tunnel will be extended several hundred feet to thoroughly explore sheelite production possibilities of the area.

»»» Utah's coal producing areas are being called upon to produce a far greater tonnage than is possible under present limited working hours and the inadequacy of equipment, according to B. P. Manley, secretary of the Utah Coal Operators' Association. The state's production in 1942 reached 5,000,000 tons, an increase of 43 percent over the previous year, as against a national increase of 13 percent. An additional 1,000,000 tons per year could be used in Utah and surrounding states from the Utah mines. The operators have repeatedly suggested that the mines work longer hours, but so far no favorable solution or answer has been forthcoming from CIO union headquarters, Mr. Manley said.

MONTANA

»»» One of the largest annual conventions in the history of the Mining Association of Montana was concluded in Butte, January 19, with the election of officers and the passage of a resolution asking the state administration and the current legislature to designate certain tax funds to the support of the state bureau of mines and to grant all possible aid in the construction of roads to isolated mines. More than 100 delegates attended.

The officers, all elected unanimously, are John Hickey of Philipsburg, president of the Moorlight Mining Company; Robert B. Porter of Helena, president of the Porter Brothers' Gold Dredging Company and of the Mike Horse Mining and Milling Company (lead and zinc), first vice president; W. R. Callaway of Sheridan and Billings, who is interested in the chrome development activities at Red Lodge, second vice president; Carl J. Trauerman of

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Butte, president of the Ruby Gulch Mining Company, secretary-treasurer; Dr. Francis A. Thomson of Butte, president of the Montana State School of Mines and director of the Montana bureau of mines and geology, chairman of the executive committee; and Anthony Strojan, Jr., of Helena, Montana manager of the Winston Brothers' Gold Dredging and Contracting Company, immediate past president and member of the executive committee.

The interesting feature of the program was a question-and-answer session, during which the following technicians clarified scores of important up-to-the-minute trends in the mining industry; John H. O'Connell, U. S. employment service, Helena, and C. P. Biffle, U.S.E.S., Helena, "Mining Loans"; A. J. Munzenrider, war production board, Helena, "Priorities"; B. L. McFerran, WPB, Helena, "Metal Prices"; Ben H. Chestnut, WPB, Helena, general subjects; Earshel W. Newman, Helena, U. S. Bureau of Mines, general subjects; John F. Vest, U.S.E.S. of the war manpower commission, "Manpower"; E. W. Hunke, office of price administration, Helena, general subjects; Dr. E. S. Perry, state bureau of mines, Butte, general subjects; Arthur V. Corry, buyer of minerals for the Metals Reserve Company and the RFC, Butte, "Prices and Shipment of Metals"; E. W. Johns, OPA mileage rationing officer, Helena, general subjects; W. G. Maloney, wage stabilization and public contracts division, Butte, general subjects, and R. E. Morgan, head grazier, U. S. Department of Interior (mine roads), general subjects.

J. C. Archibald of Helena was chairman of this section of the program.

IDAHO

»»» Three Day controlled mining companies, Tamarack & Custer, Sherman Lead and Dayrock, declared dividends late in December. Tamarack & Custer was for $200,000; Sherman Lead, $147,000; and Dayrock, $35,116.

»»» Bunker Hill & Sullivan Mining Company officials announce the company's new $1,000,000 zinc fuming plant will be ready for initial operations early in February. Construction work has been delayed because of priorities. The plant is designed to recover 35 to 50 tons of zinc a day from blast furnace slag mixed with additional tonnage from old slag dumps.

»»» Sunshine Mining Company is producing 50 to 60 tons of high-grade manganese ore daily from the Crescent mine on the Olympic peninsula near

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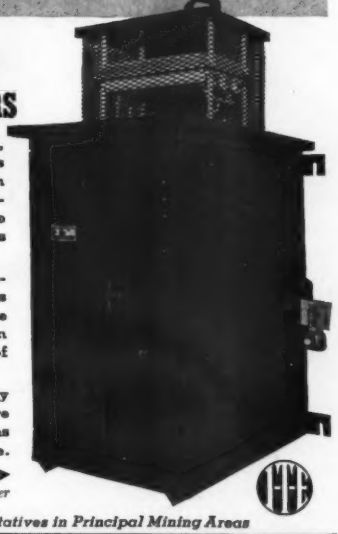

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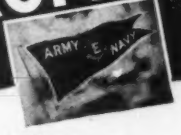

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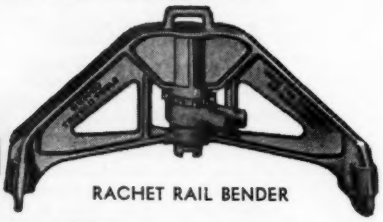
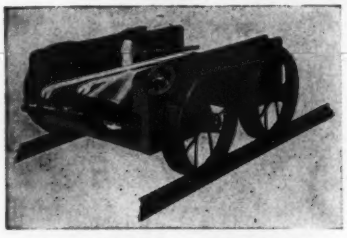


RACHET RAIL BENDER



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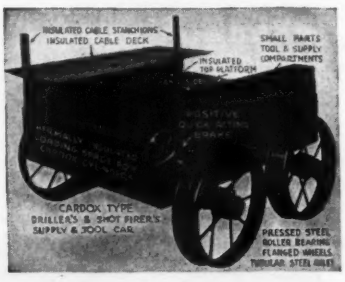
CAR RERAILER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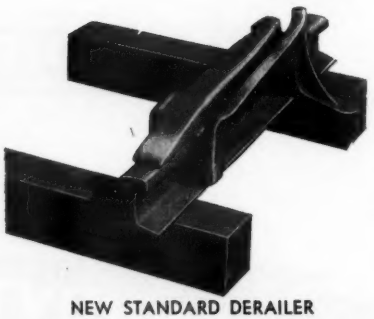
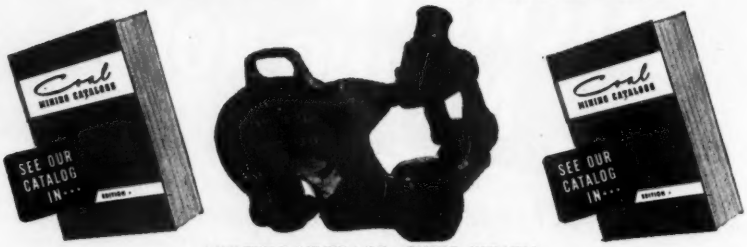


NEW STANDARD DERAILER



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ALTON, ILLINOIS

Port Angeles, Wash. About 40 men are employed under the management of Roland King, resident engineer.

»»» L. K. Requa, manager of the Idaho Almaden quicksilver mine near Weiser, Idaho, announces permanent closing of the property because of exhaustion of the ore deposits. Sons of former President Herbert Hoover were interested in the property, which has been highly productive during its short life.

»»» Federal M. & S. Company has unwatered the 600-ft. level in the old Helena-'Frisco mine. The company is now producing 50 to 60 tons of zinc-lead ore per day from the 200 and 400 levels and will shortly increase the output to 100 tons a day. The ore is being milled at the company's Morning mill.

»»» Salmon City, county seat of Lemhi County, Idaho, reports the opening of a commercial coal seam within two miles of the city limits. The coal is said to be 5 to 6 ft. wide and produces a good grade of lignite.

»»» The Douglas Mining Company, controlled by Bunker Hill & Sullivan Mining Company and the Hecla Mining Company, has leased the Douglas mine on Pine Creek to the Small Leasing Company, which is seeking to obtain priorities to build a 150-ton mill at the mine. During 1915-16 the mine was operated under lease by the Anaconda Copper Mining Company, which mined and shipped to the Anaconda smelter 8,244 tons of ore with an average mineral content of 4.8 ounces silver, 8 percent lead, and 24.5 percent zinc. Anaconda realized $23,476.94 net profits after paying the Douglas company $24,000 in royalties of $3 per ton. Recently Jesse R. Villars, of Cedar City, Utah, secured a lease on the Douglas dump, consisting of rejects left by Anaconda, and netted a profit of $8,917.75 after milling and smelting costs.

CALIFORNIA

»»» The U. S. Vanadium Corporation, Bishop, has obtained additional mechanical loading equipment from the Eimco Corporation to speed tunnel operations at its tungsten property. A. I. Rodriguez is mine superintendent.

»»» The Mica Gem Mining & Milling Co., La Mesa, is reported to be developing mica and scheelite on its properties near Jacumba and is plan-

Buildings near the tunnel of the Rifle vanadium mine tunnel, Colorado

ning to build a 100-ton mill. Thomas J. Williams is president, John Dahl vice president, and Edward Boughton secretary.

The Tax Picture

(*Continued from page* 86)

post-war refund, now reached at $6,000), in case (b) his return would be 6¾ percent on the assumed investment and the corporation would have to earn about 2½ times the net return to the stockholder; in case (c) his return would be less than 4 percent and the corporation would have to earn over 4 times the net return to the investor. Furthermore, the net result from the investment would have to be computed on the average results of a series of years, good and bad, and with the expectation that in the end the investor could recover his investment unimpaired.

This is not presented as a gloomy prophecy of what is to be. I think we would be foolish or negligent if we let such situations persist. Yet these are the conditions which now exist and will continue to exist if they are not changed.

Existing enterprises may continue so long as they can without new financing, in spite of high taxes which may reduce the net yield to the investor below the reasonable return which would attract new investment.

New investments, however, will only be made with the expectation of a net return to the investor sufficient to warrant the risk involved. If the prospective investor feels that a probable average return of 6 percent, 8 percent or 10 percent net to him is necessary to cover the risk of the venture, but sees that the best he can hope for after taxes is 4 percent or less, the investment will be unattractive. Thus, while established industries may continue although taxes greatly impair their net yield, these same tax rates may be choking off new investments. Our industrial system cannot continue without new enterprises and new investments.

The patrotic urge to do their part in the war effort is undoubtedly today causing many to go into ventures to aid the war regardless of adequacy of probable return to meet risk involved. Yet this willingness to take risk to aid the war is discouraged if Government, through arbitrary taxes on nominal income, threatens the loss of capital invested.

Our first objective today is to win the war. We all must do, and must cooperate in doing, what is necessary to this end. It is not unreasonable to ask the government itself to cooperate in its taxation.

Admittedly, we are today in abnormal conditions where the Government is ready to furnish the capital for war necessities if it is not otherwise available, but this is not the situation we hope to find when we can again return to our normal life. Yet, whether or not we want it, it is the condition which will be brought about if present tax rates are to continue for the future. Present tax rates and laws place an intolerable load on business—a load which business cannot permanently carry. The simple answer might be that after the war the tax rates on business would be reduced so business could be re-constituted and survive. Whether we will do this or not seems to depend on whether we really want our industrial system to survive and whether we will honestly and intelligently face the facts.

What I have here presented is a very incomplete picture. It mentions only a few of the factors and problems. I am not a pessimist who sees no hope for the future. I am simply pointing out some of the dangers and disturbing features I see, and suggesting further lines for thought and study, but believing all the time that there is nothing in the present situation which is hopeless. I firmly believe that with foresight and wisdom we can avoid dangers which threaten and meet the future better than the past. But we cannot hope simply to drift along and trust that others will protect us.

War Production Drive in Mining Industry

Labor-management committees are directing war production drives in a total of 1,900 American war plants, representing approximately 3,750,000 employes, War Production Drive Headquarters announced early in January.

Among 100 new plants reporting the formation of joint committees to promote more, better and faster production of war materials for our armed forces and allies at the close of 1942 were 20 plants engaged in the mining of non-ferrous metals and coal. The first coal mine to be reported from West Virginia, the West Virginia-Pittsburgh Coal Company, of Wellsburg, was among the new coal mines, numbering 10.

Launched last March, the War Production Drive has shown a growth averaging nearly 200 committees per month. Among the war industries participating in the drive, through joint committees, guns and ordnance plants show the largest number of committees, while ship-building leads in point of total workers.

The names of the non-ferrous metal and coal mining companies included among the latest 100 plants which labor-management committees have been formed follow:

Montana: American Smelting & Refining Co., East Helena; Anaconda Copper Co., East Helena.

New Mexico: Nevada Consolidated Copper Co., Santa Rita; Nevada Consolidated Copper Co., Hurley.

Ohio: United States Coal Co., Crow Hollow No. 2 Mine, Smithfield.

Pennsylvania: Eichenlaub Coal Co., Loudon Mine, Altoona; Eichenlaub Coal Co., McNelis Mine, Altoona; Eichenlaub Coal Co., Page Mine, Coupon; Eichenlaub Coal Co., Russet Mine No. 4, Altoona; Fork Coal Mining Co., Hughes Mine No. 11, Fallentimber; A. L. Light, Special, Punxsutawney; Mazenko, George J. Coal Co., Mazenko Mine, Dysart; Nugent Mining Co., Rattlesnake Mine, Brockport; Spangler & Duncan Coal Co., Barnesboro.

Utah: New Park Mining Co., Keetley; Park Utah Consolidated Mines Co., Keetley Unit and Park City Utah, Mines Co., Keetley; Park Utah Consolidated Mines Co., City Unit, Park City; Silver King Coalition Mines Co., Park City.

Washington: American Smelting & Refining Co., Tacoma; Howe Sound Co., Chelan Division, Holden; Northwest Magnesite Co., Chewelah.

West Virginia: West Virginia-Pittsburgh Coal Co., Wellsburg.

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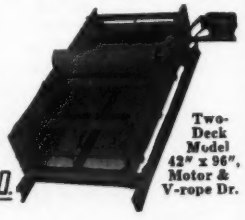
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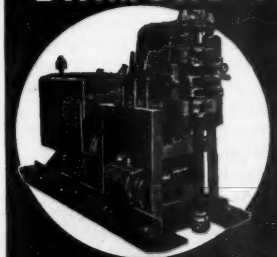
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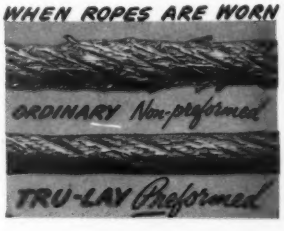

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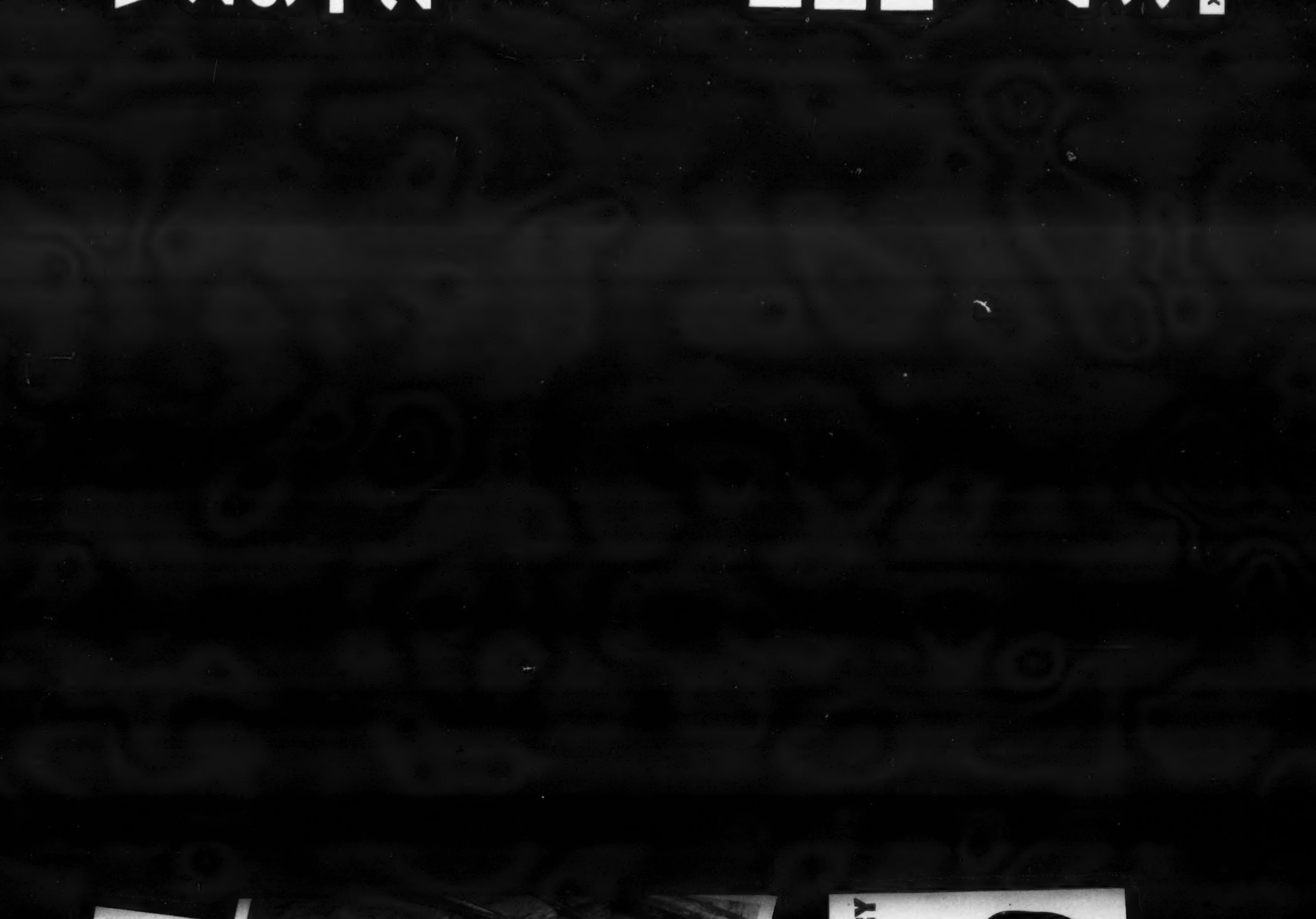
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